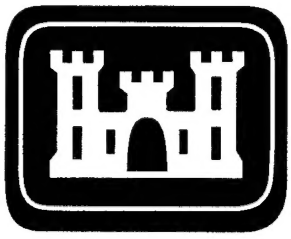
SYNTHESIS OF THE PREHISTORIC AND HISTORIC ARCHEOLOGY OF COOPER LAKE,
DELTA AND HOPKINS COUNTIES, TEXAS

by
Ross C. Fields
Marie E. Blake
and
Karl W. Kibler



US Army Corps
of Engineers
Fort Worth District

REPORTS OF INVESTIGATIONS, NUMBER 104

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION Unclassified	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) Reports of Investigations No. 104	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION Prewitt and Associates, Inc. 6b. OFFICE SYMBOL *(If applicable)*	7a. NAME OF MONITORING ORGANIZATION U.S. Army Corps of Engineers, Fort Worth District
6c. ADDRESS (City, *State, and ZIP Code)* 7701 N. Lamar, Suite 104 Austin, Texas 78752-1012	7b. ADDRESS (City, *State, and ZIP Code)* P. O. Box 17300 Fort Worth, Texas 76102-0300
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Same as 7a 8b. OFFICE SYMBOL *(If applicable)* CESWF-PL-RC	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER Contract No. DACW63-96-D-0008 Delivery Order No. 0014
8c. ADDRESS (City, *State, and ZIP Code)* Same as 7b	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO.

11. TITLE *(Include Security Classification)*
Synthesis of the Prehistoric and Historic Archeology of Cooper Lake, Delta and Hopkins Counties, Texas

12. PERSONAL AUTHOR(S)
Ross C. Fields, Marie E. Blake, and Karl W. Kibler

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT *(Year,Month,Day)*	15. PAGE COUNT
Final Report	FROM 10-94 TO 3-97	March 1997	244

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue *on reverse if necessary and identify by block number)*
FIELD	GROUP	SUB-GROUP	Cooper Lake, Archeology, Prehistory, History
05	06		

19. ABSTRACT *(Continue on reverse if necessary and identify by block number)*

This report summarizes and synthesizes the results of cultural resources efforts sponsored by the U.S. Army Corps of Engineers, Fort Worth District, at Cooper Lake in Delta and Hopkins Counties, Texas. The work described was carried out between 1951 and 1994 and involved numerous projects aimed at inventorying the resources, assessing their eligibility for listing in the National Register of Historic Places, and further investigating those found to contain important data. The report consists of four chapters and four appendixes. Chapter 1 describes the environmental setting and summarizes the history of the cultural resources efforts. Chapter 2 describes the prehistoric site database. Chapter 3 is a topically organized synthesis of the information from the prehistoric sites. The appendixes contain an inventory of all known sites at Cooper Lake, a list of all radiocarbon dates from the project area, a discussion of additional dates obtained during this project, and an analysis of the human remains from the project area.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION Unclassified
22a. NAME OF RESPONSIBLE INDIVIDUAL Jay R. Newman	22b. TELEPHONE *(Include Area Code)* (817) 978-6388 22c. OFFICE SYMBOL CESWF-PL-RC

DD Form 1473, JUN 86 *Previous editions are obsolete.* SECURITY CLASSIFICATION OF THIS PAGE

SYNTHESIS OF THE PREHISTORIC AND HISTORIC ARCHEOLOGY OF COOPER LAKE, DELTA AND HOPKINS COUNTIES, TEXAS

by

Ross C. Fields

Marie E. Blake

and

Karl W. Kibler

with Contributions by

Timothy K. Perttula

D. Gentry Steele

and

Diane Wilson

Principal Investigator: Ross C. Fields

REPORTS OF INVESTIGATIONS, NUMBER 104

Prewitt and Associates, Inc.
Consulting Archeologists
Austin, Texas

March 1997

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

This report summarizes and synthesizes the results of cultural resources efforts sponsored by the U.S. Army Corps of Engineers, Fort Worth District, at Cooper Lake in Delta and Hopkins Counties, Texas. The work described was carried out between 1951 and 1994 and involved numerous projects aimed at inventorying the resources, assessing their eligibility for listing in the National Register of Historic Places, and further investigating those found to contain important data. The report consists of four chapters and four appendixes. Chapter 1 describes the environmental setting and summarizes the history of the cultural resources efforts. Chapter 2 describes the prehistoric site database. Chapter 3 is a topically organized synthesis of the information from the prehistoric sites. Chapter 4 provides a summary of the work done at and the information recovered from the historic sites. The appendixes contain an inventory of all known sites at Cooper Lake, a list of all radiocarbon dates from the project area, a discussion of additional dates obtained during this project, and an analysis of the human remains from the project area.

ACKNOWLEDGMENTS

While the people who contributed to the cultural resources work at Cooper Lake over the years are too numerous to list here, it is possible to acknowledge those involved specifically with this synthesis. First on the list are Dan McGregor and Jay Newman of the U.S. Army Corps of Engineers, Fort Worth District. Dan was instrumental in designing the study and initiating it, and Jay provided oversight during its completion. Dan also freely shared information and insights he gained during his work at Cooper Lake for Southern Methodist University, as did Bill Martin and Maynard Cliff (now of the Texas Historical Commission and Geo-Marine, Inc., respectively). Tim Perttula deserves special credit for his continuing efforts to make sense of the data resulting from the excavations at the Hurricane Hill site by the University of North Texas. He was aided in this effort during this project by Bo Nelson. Retrieval of materials for reanalysis during the synthesis was made possible by Sue Linder-Linsley of Southern Methodist University, David Jurney of Mercyhurst College (Archaeology Research Program), and Darrell Creel of the Texas Archeological Research Laboratory.

Ross C. Fields served as Principal Investigator for the project and wrote Chapters 2 and 3 and part of Chapter 1. Eloise F. Gadus did the ceramic analysis incorporated into Chapter 3, and she prepared Figures 10 and 12. L. Wayne Klement did the analysis of the lithic artifacts upon which parts of Chapter 3 are based. Karl W. Kibler provided the summary of the geology and geomorphology in Chapter 1. Marie E. Blake synthesized the historical data and wrote Chapter 4. Support within Prewitt and Associates was provided by Karen Gardner (collections and data base management), Sandra Hannum (preparation of maps and report layout), Ellen Atha (artifact illustrations), Helen Holum (editing), and Linda Nance Foster (editing and report production).

INTRODUCTION

1

This report is the last in a series of reports on cultural resources work sponsored by the U.S. Army Corps of Engineers, Fort Worth District, at Cooper Lake in Delta and Hopkins Counties, Texas (Figure 1). Cooper Lake is at the western edge of northeast Texas, immediately south of the town of Cooper, northeast of Commerce, and north-northwest of Sulphur Springs. The dam for the lake is about 13 km downstream from where the Middle Sulphur and South Sulphur Rivers join, and it impounds a conservation pool of about 19,300 acres. Parks and wildlife management areas occupy an additional 14,200 acres around the margins of the lake.

The objective of this report is to summarize the work done at the lake since 1951 and to synthesize the most important results of that work. For various reasons explained below, this synthesis uses selected data rather than all of the information recovered over the years from the project area. The data not synthesized here could be used in a number of ways by researchers interested in the archeology and history of the region, and some of these are highlighted in the discussions below.

This report consists of four chapters and four appendixes. The remainder of this chapter describes the environmental setting of the project area and summarizes the history of the cultural resources efforts. Chapter 2 provides an overview of the prehistoric site database and describes the more intensively investigated sites individually. Chapter 3 is a topically organized synthesis based predominantly on the information from the 13 most informative of the tested and excavated prehistoric sites. Chapter 4 provides information for the historical resources that parallels that given in Chapters 2 and 3 for the prehistoric resources. The appendixes contain an inventory of the known sites at Cooper Lake, a list of all radiocarbon dates from the project area, a discussion of 18 additional dates obtained during this project from the Hurricane Hill site, and an analysis of the human remains from burials at Cooper Lake. Also produced during this project was a brief popular report aimed at a more general audience.

ENVIRONMENTAL SETTING

Geology and Geomorphology

Cooper Lake is located within the West Gulf Coastal Plain physiographic province (Fenneman 1938:102–104), a gently rolling, southeastwardly sloping plain marked by a series of low escarpments. East-west-striking faults of the Talco-Mexia fault zone parallel the Middle Sulphur and South Sulphur Rivers on both sides of the valley, their downthrown sides facing toward the stream (Barnes 1966). Prior to the creation of Cooper Lake, the South Sulphur River flowed through a graben, i.e., a downthrown fault block (Ferring 1989:E-5). Faulting, particularly along the south valley wall (Barnes 1966; Ferring 1989:E-5), and the regional southeasterly dip influenced the symmetry and morphology of the South Sulphur River valley contributing to the development of low-gradient northern slopes and relatively steep southern slopes (see Bousman et al. 1988:3–6; Ferring 1989:E-6). Tributaries with large drainage basins enter the South Sulphur River from the north, while smaller, more-ephemeral tributaries enter from the south (Moir et al. 1989:1-8).

The valleys of the Middle and South Sulphur Rivers, facilitated by local faulting, cut through the upper Cretaceous Navarro Group and the Neylandville Formation. The formations consist of clays that are silty, calcareous, and locally sandy, and are exposed primarily on the valley slopes (Figure 2).

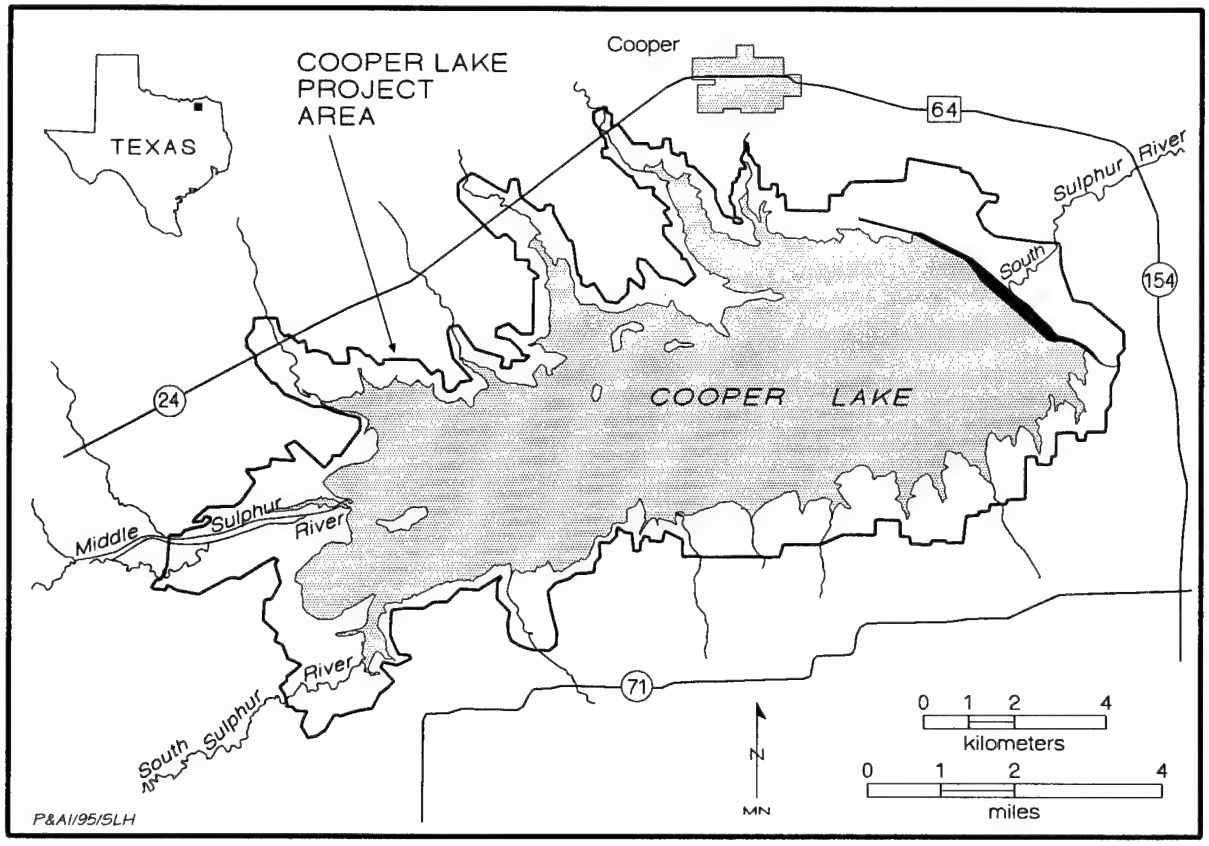


Figure 1. Map of Cooper Lake.

On the south side, the Paleocene Midway Group is exposed in the heads of tributaries and side drainages. In some areas, the Midway Group can be divided into the Kincaid and Wills Point Formations. The Midway Group formations are calcareous clays that include silty and sandy areas (Barnes 1966).

Capping some of the upland divides is a veneer of lag gravels known as the Uvalde Gravels (Byrd 1971). The small, scattered erosional remnants are present in the uplands south of the South Sulphur River and in limited areas of the upper drainages of tributary streams north of Cooper Lake. These gravels, consisting mostly of quartzite but also containing variable quantities of chert, silicified wood, and quartz, were transported and deposited by rivers draining the Ogallala Formation during the Miocene and Pliocene. They are important archeologically because of their use as a raw material source for the manufacture of lithic tools by the prehistoric inhabitants of the Cooper Lake area.

The South Sulphur River carved a broad valley into these upper Cretaceous and Paleocene formations during the Pleistocene, and the valley was later filled with alluvial and colluvial sediments estimated to be 8–17 m thick (Darwin et al. 1990:58). Today the South Sulphur is an underfit stream with a well-developed meander system including relict channels, meander cutoffs, and oxbows. The late Quaternary deposits represent a complex history of late Pleistocene and Holocene deposition, erosion, and pedogenesis. This complexity led Ferring (1989:E-34) to recommend concentrated efforts on deeply buried sites or particular localities where specific geomorphological issues could be addressed rather than attempting broad-scale geomorphological interpretations for Cooper Lake.

The late Quaternary deposits consist primarily of fluvial and alluvial fan deposits, with minor local accumulations of eolian sediments. In general, the alluvial deposits are limited to the valley bottoms, as the upland reaches of tributary drainages tend to be erosional. The alluvial fan deposits have coalesced into a thick apron on the south side of the valley (Fields et al. 1993:171–175; Gadus, Fields, Bousman, and Howard 1992:25–32). Local colluvial caps are common on eroded terrace surfaces on the

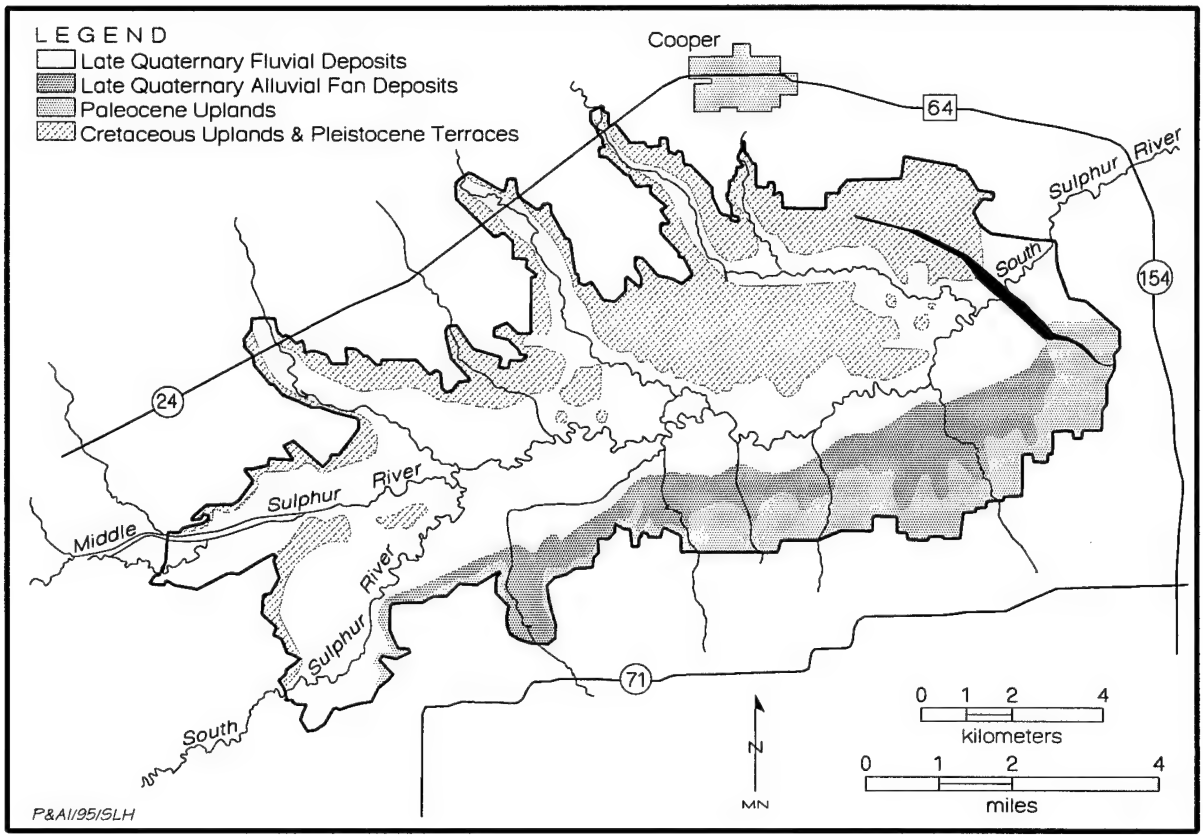


Figure 2. Schematic plan of the primary depositional units at Cooper Lake (adapted from Jurney and Bohlin 1993:60).

north side (Ferring 1989:E-21; Fields et al. 1994:49-50), while thin eolian deposits may be present on some upland and terrace surfaces (Ferring 1989:E-9).

In an early study of the South Sulphur River valley, Slaughter (1964) defined two Pleistocene terraces on the north side of the valley. He defined a T_2 terrace composed of basal gravels and upward-fining deposits 12 m above the floodplain and a T_1 terrace composed of a much sandier fill 6 m above the modern floodplain. Below the modern floodplain, Slaughter (1964:8) noted 6 m of late Pleistocene fill buried by approximately 2 m of Holocene deposits. Slaughter correlated the Pleistocene fill of the floodplain to the Sulphur River Formation defined in the North Sulphur River by Slaughter and Hoover (1963). Separated by an erosional unconformity, the overlying Holocene sediments were estimated to have been deposited within the last 2,000 years. Based on this, Slaughter (1964) believed that a long period of erosion and downcutting occurred in the South Sulphur River valley from ca. 7000 to 3000 B.P.

This interpretation fit well with the fact that intensive archeological research at Cooper Lake in the 1970s failed to encounter sites older than 2000 B.P. However, recent studies have found that the terrace system is more complex, that earlier defined erosional episodes are either not as prominent as first proposed or altogether absent from the alluvial sequence, and that alluvial fan deposition played a major role in the filling of the South Sulphur River valley throughout the Holocene (Bousman et al. 1988; Darwin et al. 1990; Ferring 1989; Fields et al. 1993; Gadus, Fields, Bousman, and Howard 1992). In fact, Bousman et al. (1988) demonstrated that sedimentation along the South Sulphur River has been more or less continuous, at least in some areas, since the end of the Pleistocene epoch.

Bousman et al. (1988:93–99) defined a six-stage depositional model or alluvial chronology for the South Sulphur River basin at Cooper Lake, noting that the sedimentary sequences on the north side of the valley were different from those on the south side. They presented this sedimentary model as a preliminary interpretation of late Pleistocene and

Holocene depositional events in the basin. However, subsequent geological research at individual archeological sites has altered some of their interpretations. The first stage was represented by extremely weathered clayey sediments, referred to as "basement clays," and correlated to the T_2 and T_1 terraces of Slaughter (1964). Although Slaughter and later Ferring (1989:E-4 through E-5) suggested that these terraces were alluvial in nature, Bousman et al. (1988) noted that many, particularly the T_2 terraces, were actually eroded Cretaceous surfaces or strath terraces.

The second stage of deposition was represented by a channel deposit cut into a bench of Stage I sediments. Basal sediments from the channel deposit dated to the end of the Pleistocene, implying that the Stage I deposits predated the presence of human beings in North America and that the older strath terraces were extensively eroded at this time or earlier. Floodplain and other alluvial deposits associated with Stage II are very limited and probably have been obliterated by more-recent erosion.

Stage III deposits were observed mostly on the south side of the valley, although evidence of small inset fills was documented on the north side of the Middle Sulphur River. Bousman et al. (1988:96) correlated these deposits with the upper Sulphur River Formation of the North Sulphur River (Rainey 1974). No deposits were discovered that would correlate with the lower Sulphur River Formation (Bousman et al. 1988:96). Two soils near the base of the Stage III deposits were dated by radiocarbon assay to the early and middle Holocene. Sediments from the top of Stage III were dated to the end of the middle Holocene. This suggests that the upper Sulphur River Formation, at least at Cooper Lake, is of early to middle Holocene age rather than late Pleistocene as suggested by Slaughter and Hoover (1963) and Slaughter (1964).

Stage IV deposits were recorded on both sides of the valley (Bousman et al. 1988:96). Radiocarbon assays from basal and upper deposits suggest that Stage IV sediments accumulated between ca. 4200 and 2100 B.P. Ferring (1989:E-26) described two late Holocene sedimentary units coeval with Stage IV, inset in older Holocene floodbasin clays (most likely coeval with Stage III) in the South Sulphur floodplain. Pleistocene-age sediments underlie both units at this particular locality. Although somewhat limited in their extent across the valley, the alluvial sediments of Stages III and IV span the early to middle Holocene depositional gap proposed by Slaughter (1964).

Stage V sediments were not observed as widely as Stage IV deposits, but they were noted on both sides of the valley (Bousman et al. 1988:96–97). The basal sediments produced a radiocarbon age of 1500 B.P., and a series of buried soils was dated between 1100 and 640 B.P. Bousman et al. (1988: 97) correlated both Stage IV and Stage V sediments to the Ben Franklin Formation defined by Rainey (1974) for the North Sulphur River valley. Ferring (1989:E-15) noted alluvial deposits of a similar age capping the lower eroded surface of a T1 terrace in the form of a low bench. This suggests that much of the valley continued to fill throughout most of the late Holocene, with extensive downcutting and erosion most likely induced by historical activities such as channelization of the South Sulphur River. Stage VI was represented by brown silt loam deposits with a surface soil away from the active river channels in the floodplain and in the uplands and black clay deposits near the river channels.

Alluvial fans are prominent along the southern wall of the valley (see Figure 2). There they have coalesced to form a thick mantle or drape on the southern valley slopes and floodplain, spurred on by active faulting or the exhumation of a faulted landscape along the south valley wall. Early recognition of alluvial fan formation and deposition within the South Sulphur River valley came from Slaughter (1964:10), who observed a 30-ft-thick (9 m) yellow clay deposit on the south side of the Sulphur along Moore Creek and suggested that these deposits "may or may not be related to the creek itself." He recovered a mineralized *Bison* metatarsal that he judged was within the size range of *B. antiquus* or *B. occidentalis* from the deposit at a depth of 20 ft (6 m). Slaughter was unsure how these feeder stream or alluvial fan deposits fit into the chronological sequence he proposed for the main valley except to suggest that the deposits could not be coeval with the T_2 terrace deposit.

Recent archeological excavations at the Finley Fan site on the south side of the valley revealed a series of six depositional units within a 6-m profile (Gadus, Fields, Bousman, and Howard 1992:30–32). The four lower units represented a period of rapid fan aggradation from the end of the Pleistocene through the early Holocene, while the upper two units accumulated slowly from the early Holocene to the present, separated by periods of surface stability

and pedogenesis. Farther out onto the floodplain, the decrease in fan aggradation is marked by late Holocene alluvial sediments from the South Sulphur River overlapping the earlier distal fan facies (Fields et al. 1993:171–173).

On the north side of the valley, thin colluvial mantles cap many of the intermediate and lower terraces. These deposits often encapsulate prehistoric sites less than 1,500 to 2,000 years old (Ferring 1989:E-7; Fields et al. 1994). The fact that few of these deposits predate the late Holocene suggests that the surfaces on the north side of the valley have continually witnessed erosion and local accumulation of colluvial sediments since the late Pleistocene. This is also evident from the Pleistocene-age (Stage II) channel fill inset in Stage I deposits (i.e., Pleistocene strath terrace).

In summary, the late Quaternary fill of the South Sulphur River valley is a complex mix of alluvial and colluvial deposits. In many areas, strath terrace surfaces have been extensively eroded or buried by more-recent alluvial and colluvial sediments. The differences between the north and south sides of the valley are striking, and this ultimately determines the character of the archeological record at Cooper Lake. In general, the south side of the basin, including the floodplain and alluvial fan complex, has a greater potential to contain intact prehistoric sites of varying ages. Extensive periods of erosion or surface stability on the north side have produced a temporal bias in the archeological record. The Cretaceous upland and Pleistocene terrace surfaces there have eroded throughout the Holocene, and in some areas they have been capped by colluvial and/or alluvial sediments of late Holocene age. It is likely that much of the erosion and channel incision is very recent due to historic land use patterns and channelization of streams.

Hydrology

Cooper Lake impounds the confluence and parts of the upper reaches of the Middle Sulphur and South Sulphur Rivers. These drainages combine with the North Sulphur River ca. 25 km downstream from the Cooper Lake dam to form a ca. 145-km-long principal tributary of the Red River, flowing into the Red River at the Great Bend in southwestern Arkansas. The North Sulphur, Middle Sulphur, and South Sulphur Rivers originate in Fannin and Hunt Counties ca. 50 km west-northwest of the Cooper Lake dam. Within the project area, the major tributaries entering from the north are Doctors, Johns, Honey, Jernigan, and Barnett Creeks. Smaller tributaries enter from the south and include Moore Creek, Buggy Whip Creek, Finley Branch, Mill Branch, and Merrit Creek. These streams derive primarily from overland flow, although springs and seeps contribute as well.

Vegetation

Cooper Lake is situated on the eastern Blackland Prairie (Figure 3), not far from the western edge of the Oak Woodlands (Diamond et al. 1987). Vegetative communities characteristic of both regions occur in the area today, albeit altered through historic land use practices.

The Blackland Prairie, which occurs in the uplands north and south of the lake, originally was dominated by tall bunch grasses, including little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardii*), yellow Indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), sideoats grama (*Bouteloua curtipendula*), hairy grama (*Bouteloua hirsuta*), and Texas wintergrass (*Stipa leucotricha*). In heavily grazed areas, these have been replaced by bermudagrass (*Cynodon dactylon*), buffalograss (*Buchloe dactyloides*), Texas grama (*Bouteloua rigidiseta*), and other grasses of lower productivity (Texas Agricultural Extension Service 1980:45; Tharp 1939:39).

The Oak Woodlands, which occurred in upland areas flanking the river as well as on valley slopes, originally were an oak and grassland savannah covered with post oak (*Quercus stellata*), blackjack oak (*Q. marilandica*), hickory (*Carya* sp.), bois d'arc (*Maclura pomifera*), and hackberry (*Celtis* sp.), with an understory of little bluestem, yellow Indiangrass, switchgrass, purpletop (*Tridens flavus*), silver bluestem (*Bothriochloa saccharoides*), and Texas wintergrass. Intensive grazing and exclusion of fire have reduced much of this area to low, dense stands of yaupon (*Ilex vomitoria*), greenbriar (*Smilax* sp.), and oak brush interspersed with grassy areas covered by red lovegrass (*Eragrostis secundiflora*), broomsedge bluestem (*Andropogon virginicus*), broomweed (*Xanthocephalum gymnospermoides*), bull nettle (*Cnoidoscolus texanus*), and western ragweed (*Ambrosia* sp.) (Jurney and Bohlin 1993:8–9; Texas Agricultural Extension Service 1980:44).

The floodplains of the Middle Sulphur and

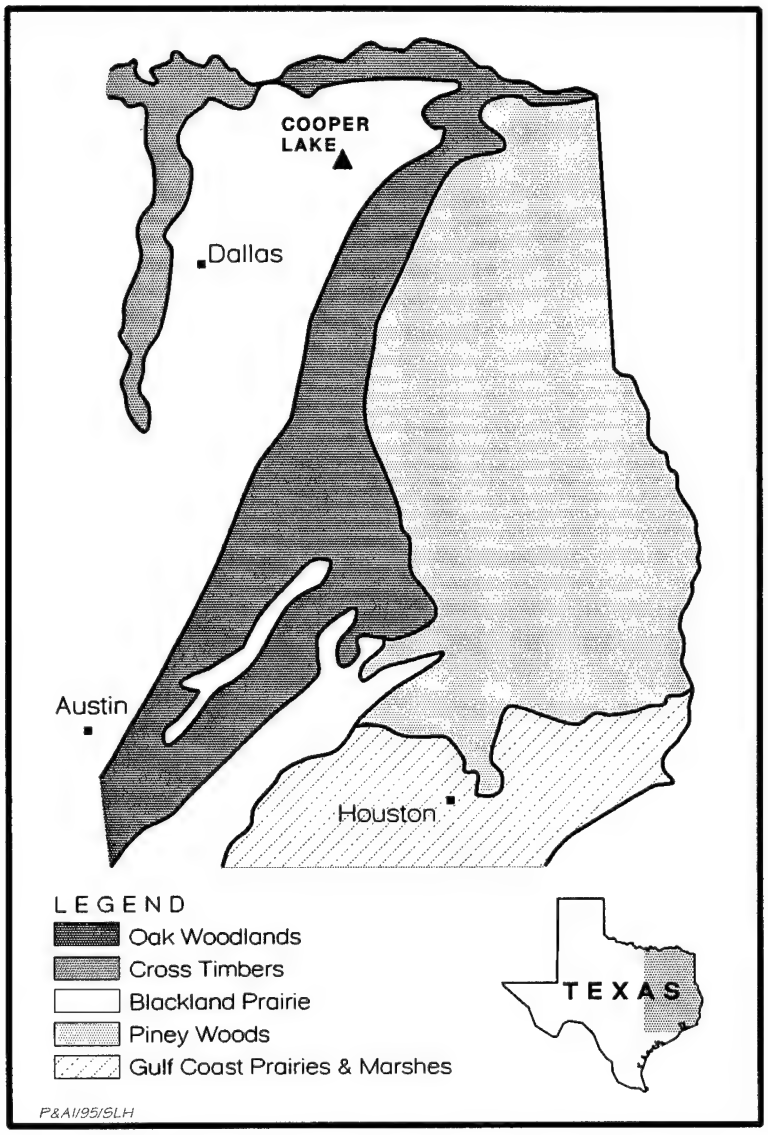


Figure 3. Location of Cooper Lake relative to the vegetation regions of eastern Texas.

The floodplains of the Middle Sulphur and South Sulphur Rivers and their tributaries supported mostly riparian woodlands and forests. The overstory vegetation was composed of American elm (*Ulmus americana*), green ash (*Fraxinus pennsylvanica*), post oak, water oak (*Quercus nigra*), red oak (*Q. falcata*), hickory, blackjack oak, bois d'arc, eastern cottonwood (*Populus deltoides*), American sweetgum (*Liquidambar styraciflua*), and sugarberry (*Celtis laevigata*), with an understory of Virginia wildrye (*Elymus virginicus*), sedge (*Cyperus* sp.), beaked panicum (*Panicum anceps*), eastern gamagrass (*Tripsacum dactyloides*), Canada wildrye (*Elymus canadensis*), switchgrass, Indiangrass (*Sorghastrum* sp.), vinemesquite (*Panicum obtusum*), and buffalograss (Jurney and Bohlin 1993:9; Ressel 1979:103, 107).

Fauna

Cooper Lake is in the Texan biotic province, an ecotone between the eastern woodlands and the western grasslands (Blair 1950:100). No vertebrate species are endemic to this area; species inhabiting the floodplain forests are native to the Austroriparian province to the east, while upland prairie areas are inhabited by species indigenous to grasslands to the west (Blair 1950:101). Ecotones have high species diversity, and this is reflected in the wide range of faunal taxa recovered from archeological sites at Cooper Lake (e.g., Yates 1989, 1993). The vertebrates recovered include fish, amphibians, reptiles, birds, and mammals. Fish and amphibians have been found in low numbers, while the reptiles are primarily turtles, present in variety and abundance, and secondarily snakes. Birds include waterfowl, ground birds, song birds, and raptors, with turkey as a predominant species. Of the mammals, deer are most frequently recovered, followed by cottontails, jackrabbits, squirrels, raccoons, and opossums. Less common but notable mammalian taxa include beaver, canids, skunk, mink, bobcat, pronghorn, and cow/bison. Ten species of river mussels also have been identified (Fullington 1989).

Climate

The climate of Delta and Hopkins Counties is humid subtropical, and it is continental in its large daily and annual temperature ranges and wide year-to-year fluctuations in seasonal rainfall. The mean annual rainfall totals between 107 and 112 cm, most

produced by thunderstorms in the late spring and early fall. The spring maximum corresponds with periods of peak flow on the South Sulphur River (Moir et al. 1989:1-6). Frost-free days average about 306 per year, with a 235-day growing season falling between late March and early November. The prevailing winds are south-southwesterly from April though August, becoming northeasterly in September through February and shifting to the west-northwest in March (Natural Fibers Information Center 1987; Ressel 1979:75).

Paleoenvironments

The question of how the environment of the Cooper Lake area may have changed during the past is not a clear-cut issue because, although a number of studies using pollen, geomorphological data, and other kinds of information have been done in eastern Texas and Oklahoma (e.g., Albert 1981; Bousman 1991; Bruseth et al. 1987; Bryant and Holloway 1985; Ferring 1982; Hall 1990; Hall and Lintz 1984; Holloway et al. 1987), not all of these studies are in agreement about the kinds of changes that occurred and the timing of these changes. Of course, this is not surprising given the variety of data sources used, the size of the area considered, the ranges of physiographic and geomorphic settings represented, the vagaries of preservation, and the variety of sampling and interpretive problems inherent in such studies. A recent attempt to present a coherent picture of paleoenvironments for the region was done as part of the Texas Historical Commission's statewide planning efforts (Collins and Bousman 1990), with the reconstruction offered there being based primarily on a reanalysis of the pollen data from two bogs (Boriack and Weakly) located well to the south of Cooper Lake along the western margins of east Texas. The bog data, which provide a record dating back some 16,000 years, suggest that the area saw alternating periods of woodlands and grasslands during the late Pleistocene and Holocene.

Grasslands appear to have dominated at four intervals (ca. 15,600–15,850, 12,500–13,100, 9600–10,150, and 2400–8200 B.P.), and woodlands predominated for much of the late Pleistocene, the early Holocene, and the latter part of the late Holocene. These changes in vegetation patterns were likely related to substantial climatic fluctuations, with relatively cool conditions prevailing during the late Pleistocene, warm and dry conditions becoming especially pronounced in the mid Holocene, and an amelioration of Altithermal conditions occurring consistently through the late Holocene. Thus, it appears that the major paleoenvironmental changes occurred prior to the late Holocene, although there may have been two intervals during the late Holocene, at ca. 500 and 1500 B.P., when grasslands expanded at the expense of woodlands. These changes in vegetation probably were associated with changes in the fauna available for exploitation by prehistoric groups, but the archeological record has yet to yield concrete evidence of this.

HISTORY OF INVESTIGATIONS

Cultural resources investigations at Cooper Lake have had a long, if somewhat sporadic, history. As Table 1 shows, 37 projects were undertaken between 1951 and 1995. While several of these were not related formally to construction of the lake (e.g., Gilmore and Hoffrichter 1964; Harris 1955; Hatzenbuehler 1953) or dealt largely with nonarcheological data (e.g., Powell 1965; Slaughter 1964), the majority of these projects focused on establishing an inventory of the cultural resources, acquiring information to assess the eligibility of the resources for listing on the National Register of Historic Places, and recovering data from sites that were judged to warrant intensive work.

Following the initial reconnaissance survey by the River Basin Surveys in 1951, little work was done at the proposed reservoir until the 1970s. The most important of the archeological projects during this 19-year interval were the excavations at two prehistoric sites—Manton Miller (41DT1) and L. O. Ray (41DT21)—by The University of Texas at Austin and the Dallas Archeological Society, respectively.

Work resumed in 1970 with a reasonably intensive but nonsystematic survey by Southern Methodist University, and this was followed over the next 6 years by a number of projects involving test excavations, surface collections, and/or extensive excavations at prehistoric sites. The most important sites investigated during this period were Manton Miller (41DT1), Tick (41DT6), Spike (41DT16), Ranger (41DT37), Luna (41DT52), Thomas (41DT80), Lawson (41HP78), Arnold (41HP102), and Cox (41HP105).

A 10-year hiatus followed this spurt of cultural resources activity. When work started again, the

TABLE 1

SUMMARY OF THE CULTURAL RESOURCES INVESTIGATIONS AT COOPER LAKE

Date	Done by	Reference	Summary of Work
1951	River Basin Surveys, Smithsonian Institution	Moorman and Jelks 1952	Initial survey, recorded 24 prehistoric sites, 15 within the boundary of the lake
1953	R. Hatzenbuehler	Hatzenbuehler 1953	Removed 1 burial from a prehistoric site
1955	R. K. Harris	Harris 1955	Removed 1 burial from a prehistoric site
1959	U.T., Texas Archeological Salvage Project	Duffield 1959	Reconnaissance survey, recorded 2 sites
1959	The University of Texas at Austin	Johnson 1962	Excavated 1 prehistoric site
1962–1964	Dallas Archeological Society	Gilmore and Hoffrichter 1964	Excavated 1 prehistoric site
1964	Southern Methodist University	Slaughter 1964	Geological reconnaissance, assessment of paleontological resources
1965	Southern Methodist University	Powell 1965	Geological reconnaissance, assessment of paleontological resources
1970	Southern Methodist University	Hyatt and Skinner 1971	Survey of unknown number of acres, recorded 105 prehistoric sites and tested 3 sites
1972–1973	Southern Methodist University	Hyatt et al. 1974	Tested 4 prehistoric sites
1973	Southern Methodist University	Hyatt and Doehner 1975	Tested 4 prehistoric sites
1974–1975	Southern Methodist University	Doehner and Larson 1978	Tested 4 prehistoric sites, excavated 2 others
1976	Southern Methodist University	Doehner et al. 1978	Tested 14 prehistoric sites and revisited 3 others, uncontrolled surface collection at 1 site
1986	Prewitt and Associates	Bousman et al. 1988	Subsurface geomorphic investigations at 22 localities including 15 prehistoric sites
1986	Prewitt and Associates	Bousman 1986; Fields and Garvey 1986	Surveyed pipeline route and monitored construction; recorded 2 prehistoric sites and 1 historic site
1986	University of North Texas	Lebo 1988	Excavated and relocated 1 historic cemetery and reconnaissance at a second cemetery, accompanied by documentary and oral history research
1986	University of North Texas	Perttula 1988	Surveyed 865 acres; recorded or rerecorded 26 sites, 10 with prehistoric components and 19 with historic components; limited documentary and oral history research
1986–1987	University of North Texas	Perttula 1990a	Excavated 1 prehistoric site
1987	University of North Texas	Perttula 1989a	Tested 3 historic sites and conducted documentary and oral history research
1987	University of North Texas	Perttula 1989b	Excavated 1 historic site and conducted documentary research

Table 1, continued

Date	Done by	Reference	Summary of Work
1987	Southern Methodist University	Moir et al. 1989	Surveyed 4,700 acres and conducted documentary and oral history research; recorded or rerecorded 72 sites, 4 of which were prehistoric and were extensively excavated, 5 of which were historic and were extensively excavated, 25 of which were prehistoric and were tested, and 22 of which were historic and were tested
1988	Southern Methodist University	Moir and Jurney 1988	Developed a research design
1989	U.S. Army Corps of Engineers, Fort Worth District	McGregor and Roemer 1989	Recorded 1 historic site
1989	Southern Methodist University	Jurney and Bohlin 1993	Surveyed 4,659 acres and conducted documentary and oral history research; recorded 34 sites, 20 with historic components and 24 with prehistoric components; rerecorded 25 sites, 15 with historic components and 14 with prehistoric components
1989	Southern Methodist University	Jurney et al. 1993	Surveyed 13,030 acres and conducted documentary and oral history research; recorded 100 sites, 72 with historic components and 38 with prehistoric components; rerecorded 44 sites, 8 with historic components and 42 with prehistoric components (1 of which was tested)
1989	Southern Methodist University	Winchell et al. 1992	Excavated and relocated 1 historic cemetery and conducted documentary research
1990	Prewitt and Associates	Fields et al. 1991	Evaluated the research design and the work to date
1990	Prewitt and Associates	Bailey et al. 1991	Surveyed 535 acres, recorded 1 prehistoric and 8 historic sites; magnetometer survey at 1 prehistoric site
1990	Prewitt and Associates	Gadus, Fields, Bousman, and Howard 1992	Excavated 1 prehistoric site
1990	Prewitt and Associates	Gadus et al. 1991	Tested 3 prehistoric sites, rerecorded 18 prehistoric sites, and evaluated the data from 5 previously excavated prehistoric sites
1991	Prewitt and Associates	Fields and Gardner 1991	Prepared a mitigation plan for the remaining National Register-eligible sites
1991	Prewitt and Associates	Gadus, Fields, and Bousman 1992	Tested 5 prehistoric sites
1991	Prewitt and Associates	Fields et al. 1993	Excavated 4 prehistoric sites
1992	Prewitt and Associates	Fields et al. 1994	Excavated 1 prehistoric site
1994	Geo-Marine	Green et al. 1996	Intensive documentary and oral history research accompanied by intensive testing at 3 historic sites
1994	Geo-Marine	Cliff, Green, Hunt, and Shanabrook 1995	Tested 2 sites with prehistoric and historic components
1995	Prewitt and Associates	This report	Summarized and synthesized cultural resources efforts

first effort consisted of a geomorphological study of the area by Prewitt and Associates, Inc. This project stemmed from the increased realization of the relevance of understanding the history of the landforms at Cooper Lake to effectively dealing with the cultural resources. This commenced the final, 8-year period over which intensive work was done prior to filling of the lake. This work was done more or less sequentially by four organizations.

In 1986–1987, the University of North Texas undertook a series of survey, testing, and excavation projects focusing on the lower part of the reservoir near the planned dam location. Notable among these projects were the extensive excavations at prehistoric site Hurricane Hill (41HP106), the excavations at the historic James Franks Farmstead (41DT97), and the excavation and relocation of the historic Tucker Cemetery (41DT104). This was the first time that the historical resources at the lake were dealt with in a systematic fashion.

Southern Methodist University again began work in the project area in 1987, and over the ensuing 2 years they undertook a number of survey, testing, and excavation projects dealing with both prehistoric and historic sites. These projects focused on the dam area as well as the reservoir margins and adjacent park and wildlife management areas. The most important of these efforts were the following: development of a comprehensive research design; excavations at four prehistoric sites (Thomas [41DT80], Doctors Creek [41DT124], Lawson [41HP78], and 41HP137); excavations at five historic farmstead sites (John C. Wright [41DT113], Zephriah Dawson [41DT118], Robert Hannah [41DT126], 41HP142, and Lodwig Vaden [41HP143]); and excavation and relocation of the historic Sinclair Cemetery (41DT105).

Prewitt and Associates, Inc., took over work in the project area in 1990. In addition to limited survey and site rerecording projects, their efforts focused on evaluating the work done to date, preparing a final mitigation plan for prehistoric and historic sites, excavating six prehistoric sites (Tick [41DT6], Spider Knoll [41DT11], Spike [41DT16], Johns Creek [41DT62], Finley Fan [41HP159], and Peerless Bottoms [41HP175]), and preparing this summary and synthesis.

Geo-Marine, Inc., conducted the final work in the project area. One project, done in 1994, sprang out of the mitigation plan developed by Prewitt and Associates and involved intensive documentary and oral history research concerning the African American community of Friendship, accompanied by extensive test excavations at three historic sites associated with this community. The second project consisted of test excavations at two sites in a planned wildlife habitat area on Corps property just upstream from the lake.

THE PREHISTORIC SITES DATABASE

2

OVERVIEW

Two hundred forty-three sites with prehistoric components have been recorded at Cooper Lake as a result of the various projects summarized in Table 1. The majority of these (n = 173) are known only from survey data, although the amount of work performed and the level of information recovered vary considerably. Most of these (n = 93) were investigated through the excavation of at least one shovel test, and backhoe trenches were dug at 33 sites. Shovel testing and trenching combined were used at 19 sites. The number of shovel tests per site ranges from 1 to 138, with 75 sites having from 1 to 10 tests. Certainly, the sites with the greatest numbers of tests (138 at 41DT227, 68 at 41DT179, 39 at 41DT143, 37 at 41HP162, 36 at 41DT163, 35 at 41DT174, and 35 at 41DT182) were examined with sufficient intensity that they may be considered to have seen testing-level investigations. Nonetheless, as a group, these 173 sites have contributed relatively little substantive information on the prehistoric archeology of the region. Probably the best information that these sites can offer lies in the small numbers of ceramics (from 36 sites), dart points (from 68 sites), and arrow points (from 18 sites) recorded on them (although these apparently were not collected in all cases). Typological studies of these temporally sensitive artifacts could yield useful data on chronologies and sociocultural interaction, although this is not done in the assemblage-based analysis presented in this synthesis.

Another 57 sites have seen investigations beyond the survey level but stopping short of data recovery excavations. While the kind and extent of work vary considerably from site to site (Table 2), these 57 sites are better documented than those known only from survey data, and some have yielded substantial quantities of potentially useful archeological data. For example, ceramics have been recovered from 32 sites, arrow points from 29 sites, and dart points from 43 sites, while radiocarbon dates have been obtained from 11 sites (not all of these dates are informative, though, since some are from noncultural contexts or are on soil humates rather than charcoal). Four of these sites have yielded data of sufficient quality (i.e., interpretable quantities of materials from isolable components; see Chapter 3 for a discussion of the selection process) that they are included in the synthetic analysis in Chapter 3 (41DT21, 41DT52, 41DT63, and 41DT154). Two sites (41DT59 and 41DT247) were not considered for inclusion in the synthetic analysis because the testing was done after work on the synthesis had commenced. The remainder are excluded because they contain badly mixed components, because of problems with how they were excavated (i.e., the test pits were not dug in levels, or the sediments were not screened), because they lack dates or temporally sensitive artifacts, because the data are not reported in a way that makes it easy to interpret them, or because the information recovered is insufficient.

Fifteen prehistoric sites have seen extensive excavations, and these have contributed a large body of valuable artifactual, ecofactual, chronometric, bioarcheological, and feature evidence for Cooper Lake, especially for the Caddoan period (Figure 4). These sites are Manton Miller (41DT1), Tick (41DT6), Spider Knoll (41DT11), Spike (41DT16), Ranger (41DT37), Johns Creek (41DT62), Thomas (41DT80), Doctors Creek (41DT124), Lawson (41HP78), Arnold (41HP102), Cox (41HP105), Hurricane Hill (41HP106), 41HP137, Finley Fan

TABLE 2

SUMMARY OF THE TESTED PREHISTORIC SITES

Site	Kind and Amount of Work	Comments*
41DT21	11 shovel tests; sixteen 1-x-1-m units; one 3-x-3-ft unit, three 3-x-3-ft units, one 4-x-4-ft unit; and one 5-x-5-ft unit; machine stripping of 360 m^2	test units dug in levels and screened; recovered sherds, arrow points, and dart points; radiocarbon dates; isolable Woodland and early Caddoan components
41DT31	one 1-x-1-m unit	dug in levels; not known if sediments were screened; recovered sherd and dart points
41DT34	15 shovel tests; six 0.5-x-0.5-m units	test units screened but not dug in levels; recovered sherds, arrow points, and dart point
41DT35	systematic surface collection; sixteen 1-x-1-m units	test units dug in levels but not screened; recovered sherds, arrow points, and dart points
41DT36	two 1-x-1-m units	test units dug in levels and screened; recovered dart points
41DT38	systematic surface collection; five 1-x-1-m units	test units dug in levels but not screened; recovered sherd, arrow points, and dart points
41DT42	seven 1-x-1-m units; 11 postholes	test units dug in levels and screened; recovered sherds, arrow points, and dart points; radiocarbon date
41DT44	eleven 1-x-1-m units; 2 postholes	test units dug in levels and screened; recovered dart points
41DT50	13 shovel tests; five 1-x-1-m units	test units dug in levels and screened; recovered sherds, arrow point, and dart points; radiocarbon date
41DT52	twenty-nine 2-x-2-m units; 4 backhoe trenches	test units dug in levels and most screened; recovered sherds, arrow points, and dart points; radiocarbon dates; isolable Woodland and early Caddoan components
41DT54	9 shovel tests; nine 1-x-1-m units; machine stripping of 240 m^2	test units dug in levels and screened; recovered sherds, arrow points, and dart points
41DT59	twenty-six 0.5-x-0.5-m units; two 1-x-1-m units; two 0.3-x-0.3-m units; 5 backhoe trenches	test units dug in levels and screened; recovered sherds, arrow points, and dart points; radiocarbon date
41DT63	7 shovel tests; three 1-x-1-m units	test units dug in levels and screened; recovered sherds, arrow points, and dart points; radiocarbon dates; isolable early Caddoan component
41DT67	4 shovel tests; two 0.5-x-0.5-m units; two 1-x-1-m units	test units screened and some dug in levels; recovered sherds, arrow points, and dart points
41DT68	100 shovel tests; three 0.5-x-0.5-m units	test units screened but not dug in levels; recovered sherd
41DT71	6 shovel tests; three 0.5-x-0.5-m units; five 1-x-1-m units	test units not dug in levels and not screened

*Artifacts mentioned include only those that are temporally sensitive.

Table 2, continued

Site	Kind and Amount of Work	Comments
41DT73	systematic surface collection; two 1-x-1-m units	not known if test units were dug in levels or screened; recovered sherds, arrow points, and dart points
41DT75	ten 1-x-1-m units; 3 postholes	test units dug in levels and screened; recovered sherds, arrow points, and dart points
41DT81	10 shovel tests; eleven 0.5-x-0.5-m units	test units screened but not dug in levels; recovered sherds and arrow point
41DT83	47 shovel tests; two 0.5-x-0.5-m units	test units screened but not dug in levels; recovered dart point
41DT84	one 1-x-1-m unit; 3 postholes	test unit dug in levels and screened; recovered sherds, arrow point, and dart point
41DT106	10 shovel tests; eight 0.5-x-0.5-m units	test units screened but not dug in levels; recovered sherds and dart points
41DT108	10 shovel tests; seven 0.5-x-0.5-m units	test units screened but not dug in levels
41DT109	20 shovel tests; six 0.5-x-0.5-m units	test units screened but not dug in levels; recovered sherd
41DT110	20 shovel tests; six 0.5-x-0.5-m units	test units screened but not dug in levels
41DT111	57 shovel tests; twenty-two 0.5-x-0.5-m units; machine stripping of 45 m^2	test units screened but not dug in levels; recovered sherds, arrow point, dart point, and glass trade bead
41DT112	10 shovel tests; seven 0.5-x-0.5-m units	test units screened but not dug in levels
41DT113	10 shovel tests; ninety-nine 0.5-x-0.5-m units	test units not dug in levels and only some screened; recovered arrow points and dart points
41DT114	13 shovel tests; seven 0.5-x-0.5-m units; 1 backhoe trench	test units screened but not dug in levels; recovered sherd and dart point
41DT115	15 shovel tests; eleven 0.5-x-0.5-m units; three 1-x-1-m units	test units screened but not dug in levels; recovered dart point
41DT116	15 shovel tests; eight 0.5-x-0.5-m units	test units screened but not dug in levels; recovered sherds and dart point
41DT117	25 shovel tests; seven 0.5-x-0.5-m units	test units screened but not dug in levels; recovered arrow point and dart points
41DT127	11 shovel tests; forty-six 0.5-x-0.5-m units; seven 1-x-1-m units	test units screened and some dug in levels; recovered sherds and dart points
41DT128	25 shovel tests; twenty 0.5-x-0.5-m units	test units screened but not dug in levels; recovered dart points
41DT133	6 shovel tests; six 0.5-x-0.5-m units	test units screened but not dug in levels
41DT134	9 shovel tests; five 0.5-x-0.5-m units	test units screened but not dug in levels; recovered sherds, arrow point, and dart point

Table 2, continued

Site	Kind and Amount of Work	Comments
41DT141	1 shovel test; five 1-x-1-m units; 6 backhoe trenches	test units dug in levels and screened; recovered arrow point; radiocarbon dates
41DT154	32 shovel tests; two 1-x-1-m units; 4 backhoe trenches	test units dug in levels and screened; recovered arrow points and dart points; isolable Woodland component
41DT161	eleven 0.5-x-0.5-m units; 2 backhoe trenches	not known if test units were dug in levels or screened
41DT181	two 0.5-x-0.5-m units	not known if test units were dug in levels or screened
41DT247	thirty-six 0.5-x-0.5-m units; one 1.0-x-0.5-m unit; 5 backhoe trenches	test units dug in levels and screened; recovered dart point
41HP18	1 shovel test; seven 1-x-1-m units	test units dug in levels and screened; recovered sherds and dart point
41HP74	systematic surface collection; 9 shovel tests; two 2-x-2-m units	test units dug in levels but not known if they were screened; recovered sherds, arrow points, and dart points
41HP77	45 shovel tests; nineteen 1-x-1-m units	test units dug in levels and screened; recovered sherds, arrow points, and dart points
41HP80	systematic surface collection; eleven 1-x-1-m units; one 2-x-2-m unit	test units dug in levels and screened; recovered dart points
41HP81	1 shovel test; eight 1-x-1-m units	test units dug in levels and screened; recovered arrow point
41HP87	systematic surface collection; eight 1-x-1-m units	test units dug in levels and screened; recovered dart points
41HP88	2 shovel tests; six 1-x-1-m units	test units dug in levels and screened; recovered sherd, arrow points, and dart points
41HP103	5 shovel tests; thirteen 1-x-1-m units	test units dug in levels and screened; recovered dart points; radiocarbon date
41HP116	2 shovels tests; four 0.5-x-0.5-m units; two 1-x-1-m units; one 2-x-2-m unit; 3 backhoe trenches	test units dug in levels and screened; recovered sherds, arrow points, and dart points; radiocarbon date
41HP118	two 1-x-1-m units; 7 backhoe trenches	test units dug in levels and screened; radiocarbon dates
41HP135	12 shovel tests; six 0.5-x-0.5-m units	test units screened but not dug in levels; recovered sherds and dart point
41HP136	11 shovel tests; twenty-two 0.5-x-0.5-m units; five 1-x-1-m units	test units screened and some dug in levels; recovered sherds, arrow point, and dart points
41HP138	13 shovel tests; twenty-five 0.5-x-0.5-m units; four 1-x-1-m units	test units screened and some dug in levels; recovered arrow points and dart points
41HP143	23 shovel tests; eight 0.5-x-0.5-m units	test units screened but not dug in levels

Table 2, continued

Site	Kind and Amount of Work	Comments
41HP155	two 1-x-1-m units; 4 backhoe trenches	test units dug in levels and screened; recovered dart points; radiocarbon dates
41HP158	seventeen 0.5-x-0.5-m units; 1 backhoe trench	not known if test units were dug in levels or screened; recovered dart point and arrow point

(41HP159), and Peerless Bottoms (41HP175). These sites are described individually below. The data from most are incorporated into the assemblage analysis presented in Chapter 3. Where this is not the case, the reasons for excluding the sites are explained here. Also included are descriptions of the four tested sites that are included in the Chapter 3 analysis (41DT21, 41DT52, 41DT63, and 41DT154).

DESCRIPTIONS OF THE EXCAVATED SITES

Manton Miller, 41DT1

The Manton Miller site is located on the crest and slopes of a prominent knoll on the floodplain north of the South Sulphur River (Figure 5). The landform probably is an eroded Pleistocene terrace remnant with a thin mantle of Holocene colluvium.

The initial work (Johnson 1962) consisted of excavations in two areas. Trenches, several isolated units, and a 200-ft² (ca. 18-m²) block were dug in Area A on top of the knoll, and trenches, several isolated units, and a 175-ft² (ca. 16-m²) block were placed in Area B on the southern slope. These excavations were performed using 0.5-ft (ca. 15-cm) levels, and the fill was screened through ½-inch mesh. The excavations in Area A reached sterile clay subsoil at depths of 30 cm or less and encountered one human burial and two pits; Area A yielded 13 sherds, 4 arrow points, 33 dart points, 17 other chipped stone tools, and 1 ground stone tool. Although not quantified by area in the report, it appears that Area A also yielded a small collection of faunal remains. Unmodified debitage was neither quantified nor collected. The excavations in Area B sampled a midden deposit up to 60 cm thick overlying sterile clay subsoil. The features in Area B consisted of one human burial, one dog burial, seven apparent hearths lacking burned rocks, and one pit. Area B yielded 264 sherds, 56 arrow points, 36 dart points, 112 other chipped stone tools, 3 ground stone tools, 1 pipe fragment, and 40 bone tools. It appears that most of the ca. 1,000 bone fragments recovered were from Area B. As in Area A, unmodified debitage was not collected. Also undertaken during this early work was the collection of materials from the site surface and the excavation of two badly fragmented human skeletons from the eroded slope between Areas A and B.

Subsequent investigations by Southern Methodist University were undertaken in Area A and consisted of a surface collection of 477 contiguous 2-x-2-m units, excavation of an L-shaped backhoe trench, excavation of 4 isolated 2-x-2-m units, and excavation of a 27-m² block (Hyatt and Doehner 1975). The manual excavations were done in 10-cm levels, encountering sterile clay from 3 to 18 cm below the ground surface. One human burial was uncovered during the backhoe excavations, while the hand excavations located 3 hearths and 10 possible postholes partly encircling an area ca. 3.5 m in diameter. The cultural materials recovered in the excavations consist of 52 sherds, 3 arrow points, 9 dart points, 127 other chipped stone tools, and 3,004 pieces of lithic debris.

Based on the results of the initial excavations, Johnson (1962:262–268) concluded that the site contains three major components dating to the late Archaic, Woodland, and Caddoan periods, with the late Archaic materials occurring mostly in Area A and the Woodland and Caddoan materials being most concentrated in Area B. These conclusions were based entirely on comparisons of the artifacts from the Manton Miller site with those from other excavated sites, as Johnson (1962:262–264) was not able to identify any vertical stratification in the archeological remains and no radiocarbon dates were obtained. The later work by Southern Methodist University, although also not resulting in radiocarbon dates, recovered convincing evidence that Area A

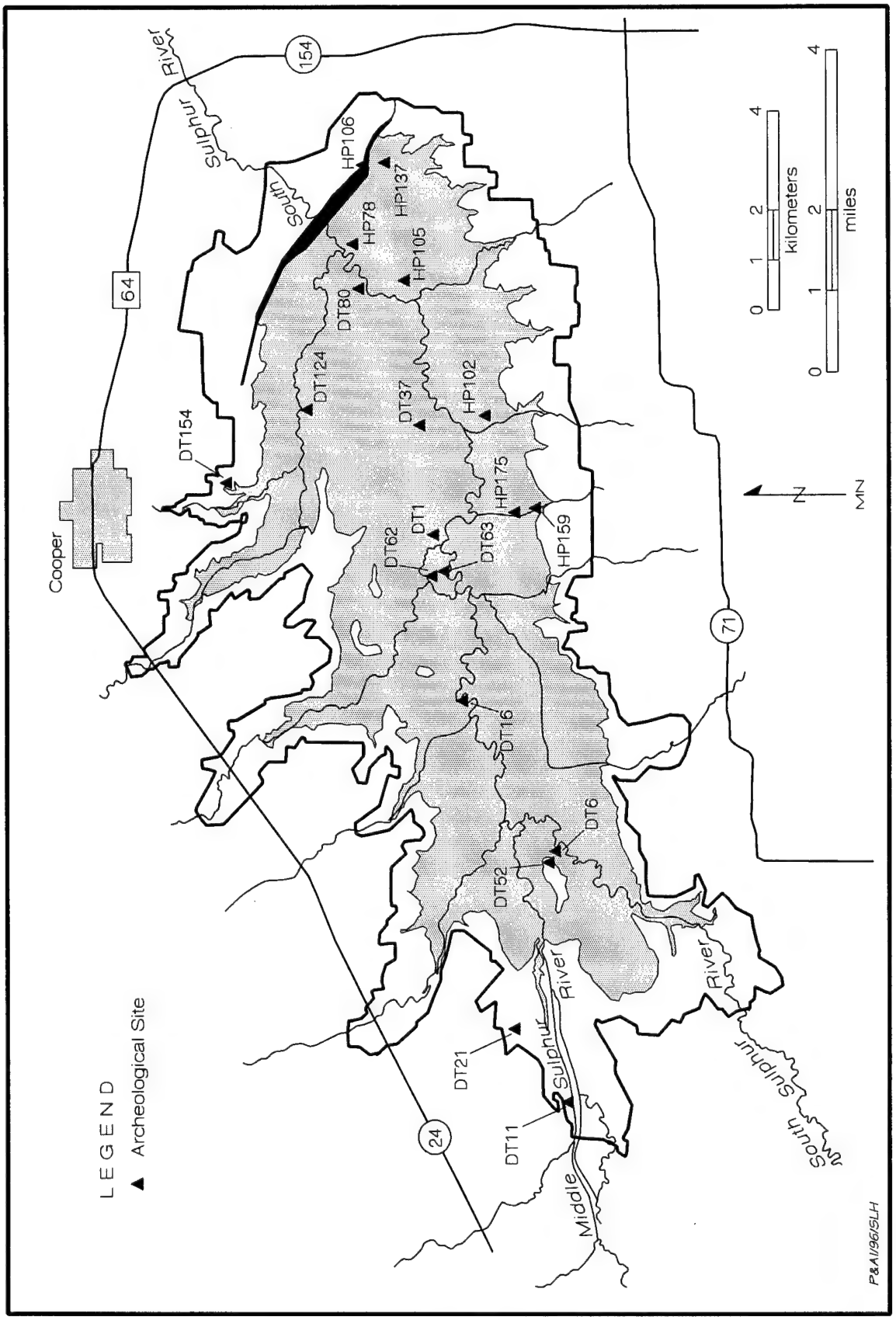


Figure 4. Map of Cooper Lake showing the locations of the mitigated sites and the tested sites used for assemblage comparisons.

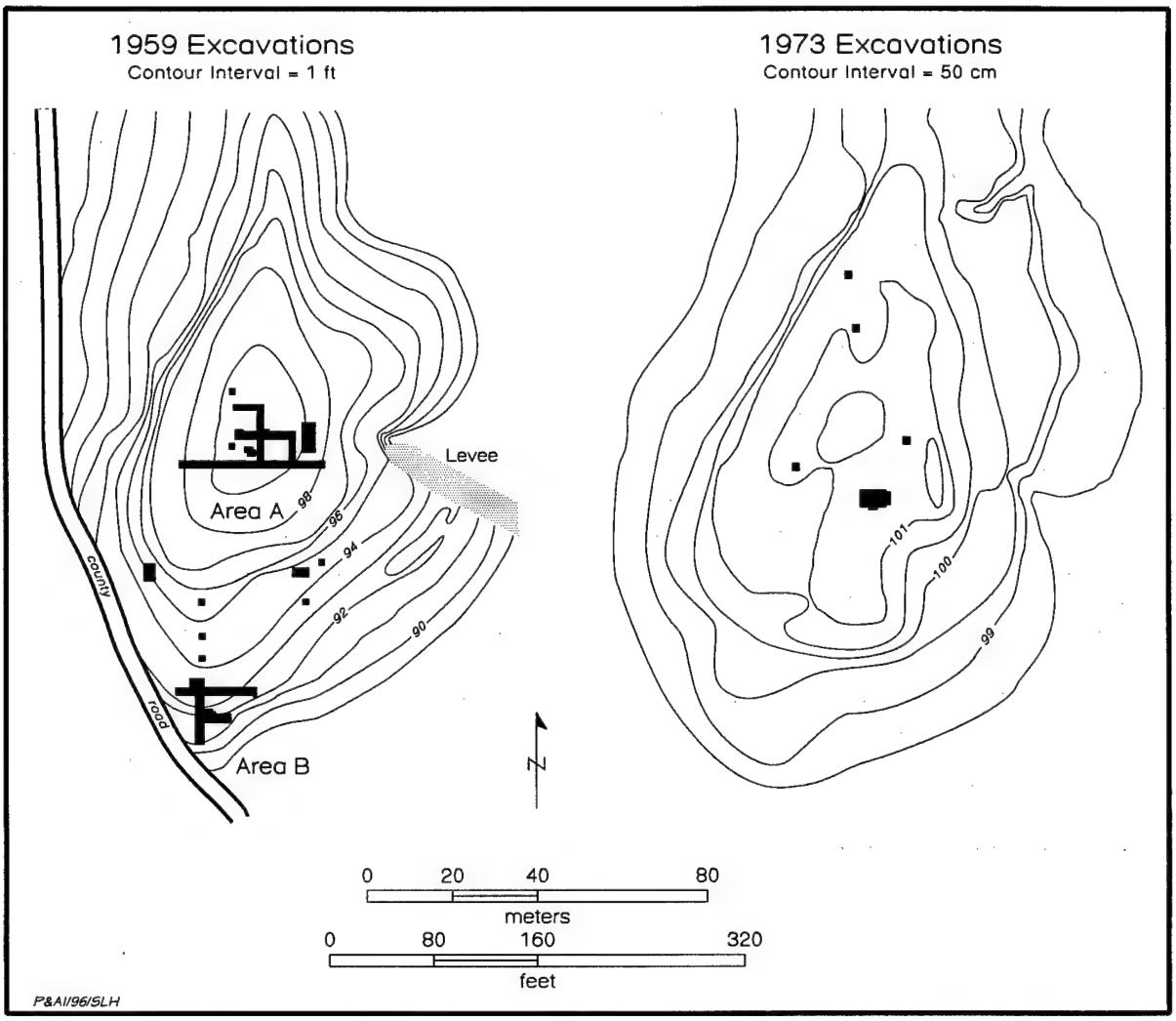


Figure 5. Plans of 41DT1 showing 1959 and 1973 excavations; the two plans cannot be correlated because they lack common reference points.

contains Caddoan period materials mixed with earlier remains, rather than the predominantly late Archaic component suggested by the earlier work.

Lacking absolute dates and stratified cultural deposits, it is difficult to assess the history of the use of the Manton Miller site. Given the great age of the landform and the thinness of the Holocene deposits, however, it is reasonable to suppose that occupations over a long span of time are represented. Certainly, the artifacts recovered point to Caddoan, probably Woodland, late Archaic, and perhaps earlier Archaic occupations. The provenience data presented in the reports indicate that none of these components can be isolated with any confidence, however, and it is for this reason (as well as the use of ½-inch screening and the fact that the debitage recovered during the initial excavations was not retained) that the site is not used in the component-based analysis presented in Chapter 3.

In spite of these shortcomings, the site did produce some valuable information. Most important is the identification of the possible structure in Area A and the possibly associated trash midden in Area B. While the Area A features were not dated, they almost certainly relate to occupation of the site during the Caddoan period, and the diagnostic artifacts recovered from Areas A and B suggest that this component dates mostly to the early part of this time span. Thus, 41DT1 may have been used in a manner similar to the other early Caddoan sites described below.

Tick, 41DT6

The Tick site is situated in thin (25–80 cm) alluvial deposits on a low floodplain knoll adjacent to the South Sulphur River (Figure 6). The initial investigations, after the site was discovered in 1951, consisted of the removal of a single human burial (Harris 1955). Southern Methodist University returned to the site and performed extensive testing in 1975 (Doehner and Larson 1978:57–67). This work consisted of the excavation of 10 isolated 2-x-2-m units in 5-cm levels; 4 additional units measuring 1 x 2 m, 1.5 x 1.5 m, 1 x 1.5 m, and 1 x 1 m were excavated adjacent to two of the 2-x-2-m units to expose features. The sediments removed were not screened. The greatest concentration of cultural materials occurred on the highest portion of the rise at its southern edge where three burials were found. These burials were in the same general area as that reported by Harris (1955). In addition to the human burials, 92 sherds, 14 arrow points, 35 dart points, 212 other chipped stone tools, 77 cores, 3,122 pieces of lithic debris, 6 ground stones, 3 possible bone tools, and ca. 2,000 bone fragments reportedly were recovered. Of the two radiocarbon assays obtained, one was modern while the other was 1320 ± 190 B.P. (see Appendix B).

Based on the temporally sensitive artifacts and the radiocarbon date, the site was judged to have components dating to the latter part of the Woodland period and the early part of the Caddoan period. Apparently, the excavators suspected that the cultural deposits were stratified, with Caddoan remains occurring in the upper 15–20 cm and Woodland materials below.

The next episode of work took place in 1989 when a crew from Southern Methodist University excavated 15 shovel tests and 1 backhoe trench south of the levee that bounded the knoll tested in 1975 (Jurney et al. 1993:8-52 through 8-55). This work identified a ca. 50-cm-thick midden buried 20–30 cm beneath the modern ground surface and extending 10 m south of the levee.

Based on the possibility that better-stratified deposits might be present off the crest of the knoll, Prewitt and Associates returned to the site in 1991 (Fields et al. 1993:43–82). Six backhoe trenches were dug, and three 1-x-1-m units were placed beneath the levee to sample the underlying deposits. These units revealed a ca. 65-cm-thick, stratified midden dating to the Woodland and early Caddoan periods (with a light late Caddoan component), and this led to the excavation of a block of 15 contiguous 1-x-1-m units; all excavated sediments were screened through ¼-inch mesh. A single cultural feature, a disturbed human burial belonging to the Woodland or early Caddoan component, was found, with the scarcity of features probably being due to the position of the excavations on the lower knoll slope adjacent to the floodplain.

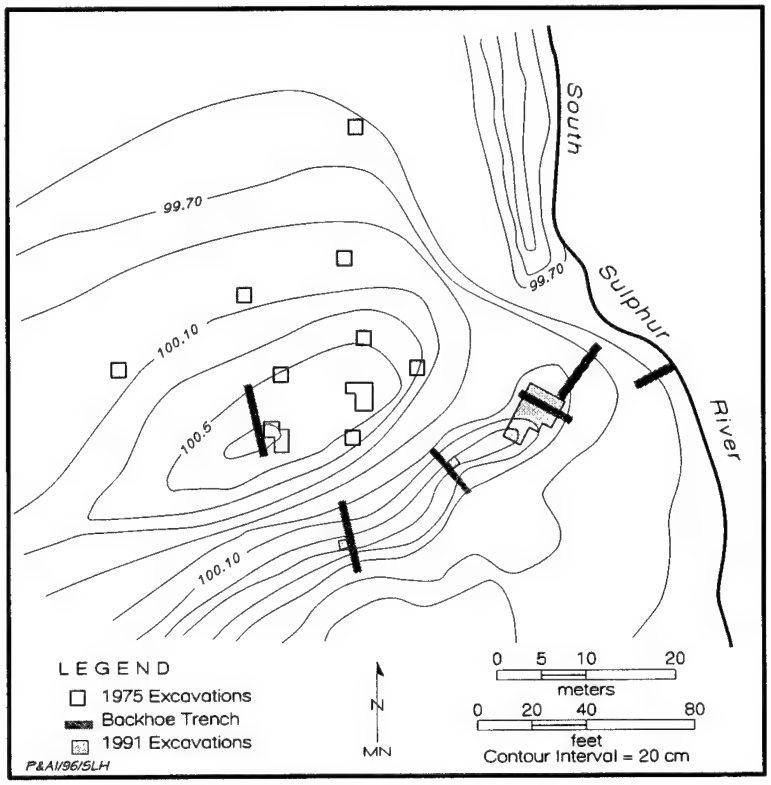


Figure 6. Plan of 41DT6 showing 1975 and 1991 excavations.

The artifacts recovered consist of 485 ceramic vessel sherds, 1 ceramic pipe fragment, 95 arrow points, 139 dart points, 569 other chipped stone tools, 87 cores, 17,808 pieces of unmodified debitage, 19 ground or battered stones, and 101 bone/shell tools and ornaments. The faunal collection is large (25.7 kg) and diverse, with turtles, deer, rabbits, other small

mammals, and mussels being the most common taxa. The collection of macrobotanical remains consists mostly of hickory nutshells, with *Pediomelum* (formerly *Psoralea*) rhizome fragments, vetch/peavine seeds, hackberry seeds, and unidentified seeds occurring in small numbers.

Based on the distributional evidence and six radiocarbon assays (see Appendix B), two components were identified. A Woodland component dating chiefly to ca. A.D. 50–700 was isolated as Analysis Unit 3/4, while a later, mostly early Caddoan component dating to A.D. 700–1000 was isolated as Analysis Unit 2; both are included in the Chapter 3 assemblage analysis. A minor late Caddoan component also was recognized, but it could not be separated from the earlier materials.

Spider Knoll, 41DT11

The Spider Knoll site sits in 25 to 90 cm of Holocene colluvium on the crest and slopes of a Pleistocene terrace just north of the Middle Sulphur River (Figure 7). The site was visited during both the 1951 and 1970 surveys, and two backhoe trenches were dug there in 1986 (Bousman et al. 1988:70–71). The trench on the summit of the landform revealed a thin (30 cm) cultural deposit confined to the plow zone, while the second trench on the slope to the south exposed a thicker (45 cm), possibly in situ midden. Site 41DT11 was next investigated in 1989 (Jurney et al. 1993:8-56 through 8-58) when a crew from Southern Methodist University excavated 45 shovel tests, most on a 20-m grid. These tests defined the limits of the site and showed that the cultural remains are most abundant in the southeastern quadrant. Further, they confirmed that the cultural deposits are thin over most of the site, thickening in the downslope, southern part.

Formal testing for National Register eligibility was undertaken in 1991 (Gadus, Fields, and Bousman 1992:21–34). Ten 1-x-1-m units were excavated, most in the southeastern part of the site, and ca. 290 m² was stripped with heavy machinery. This work confirmed that the southeastern area contains the densest archeological remains and revealed that part of this area has midden deposits extending as deep as 90 cm below the surface. Eight cultural features—two pits and six postholes—were identified in the stripped areas. The testing yielded 114 ceramic vessel sherds, 42 arrow points, 7 dart points, 117 other chipped stone tools, 7 cores, 1,477 pieces of unmodified debitage, and 3 ground or battered stones, as well as sizable samples of faunal and macrobotanical remains and a single human tooth. The five radiocarbon assays (see Appendix B) and the diagnostic artifacts suggested that the site dates predominantly to the early Caddoan period, ca. A.D. 900–1250. Based on its age, the possible presence of structures, and the presence of a midden downslope from the possible structural area, it was suggested that the site represented a small hamlet or farmstead.

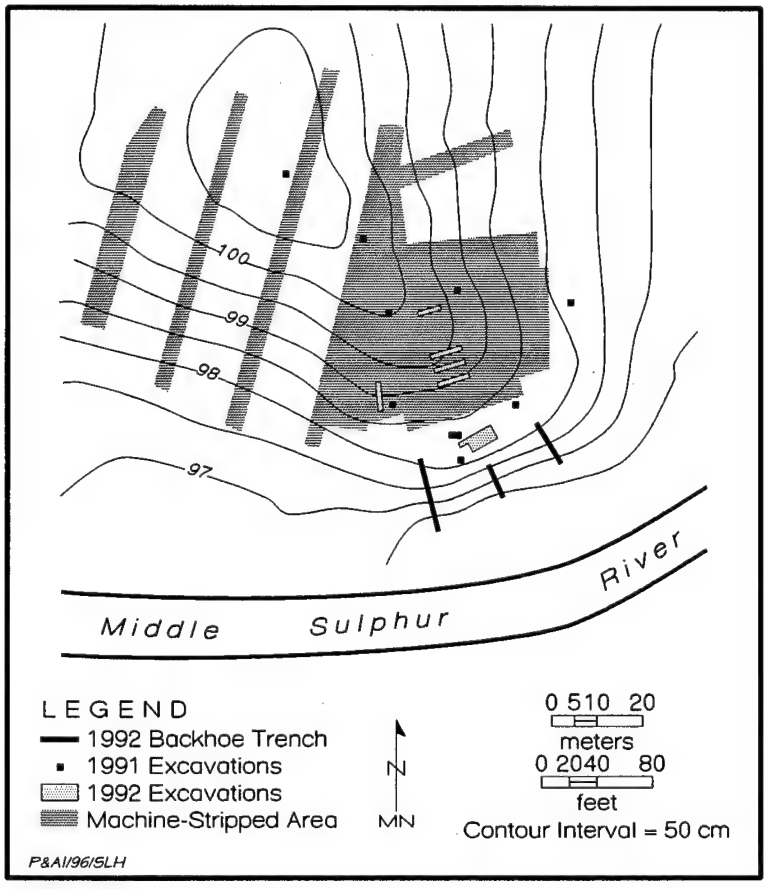


Figure 7. Plan of 41DT11 showing 1991 and 1992 excavations.

Mitigative excavations were done in 1992 (Fields et al. 1994). The work entailed the manual excavation of 50 m² and mechanical stripping of 2,760 m²; all manually excavated sediments were screened through ¼-inch mesh. Sixty-one cultural features—33 postholes, 23 pits, 3 hearths, 1 ash concentration, and 1 possible log mold—were investigated, including the 8 found in the 1991 testing. The artifacts recovered consist of 849 ceramic vessel sherds, 325 arrow points, 83 dart points, 981 other chipped stone tools, 164 cores, 10,120 pieces of unmodified debitage, 86 ground or battered stone tools, and 272 bone/shell tools or ornaments. In addition, 30 human bone fragments and 48 kg of faunal remains were recovered, with the most common taxa being turtles, deer, rabbits, and mussels. Among the macrobotanical remains are hickory nutshells, pecan nutshells, a variety of seeds (pigweed, sedge, honey locust, sunflower, sumpweed, wood sorrel, maygrass, knotweed, wild plum, grape, and *Rubus*), maize cob fragments, squash rind fragments, and *Pediomelum* rhizome fragments.

The diagnostic artifacts and the 23 radiocarbon dates (including those obtained during the 1991 testing; see Appendix B) showed that the primary occupation of the site occurred between A.D. 900 and 1300, and this early Caddoan component is included in the Chapter 3 assemblage analysis. Minor earlier and later components are present as well but could not be isolated. The extensive nature of the excavations contributed substantial information on the structure of the site during the early Caddoan period occupations. The downslope area was used mostly for trash disposal, while the upslope part of the site was used for domiciliary purposes and a variety of processing and maintenance tasks. Well-defined posthole patterns representing substantial houses were not present, and it appears that the structures built there were ephemeral.

Spike, 41DT16

The Spike site rests in alluvial deposits 55–120 cm thick on a prominent floodplain knoll adjacent to the South Sulphur River (Figure 8). After being recorded in 1951, the initial excavations were performed in 1953 when a flexed burial exposed by erosion of the riverbank was removed (Hatzenbuehler 1953). In 1976, Southern Methodist University excavated 21 isolated 1-x-1-m units and 7 postholes on and around the knoll (Doehner et al. 1978:71–101). The units were dug in 5-cm levels to depths ranging from 5 to 120 cm. Only the fill from features and the sediments from one unit were screened. Cultural materials were recovered from all but one unit and were most frequent on the crest of the knoll. The only two cultural features encountered were ash concentrations. Reportedly recovered were 310 sherds, 41 arrow points, 44 dart points, 253 other chipped stone tools, 58 cores, 6,513 pieces of lithic debitage, 1 ground stone tool, and 18 bone tools. In addition, a sizable faunal sample (n = 26,755) and scattered human bone fragments were found. Two radiocarbon samples yielded ages of 200 ± 80 B.P. and 1060 ± 70 B.P. (see Appendix B).

Based chiefly on the temporally sensitive artifacts recovered and secondarily on the distributional evidence, the Spike site was judged to have components dating from the late Archaic period through the early Caddoan period. While the excavators noted clear stratification in the cultural materials, they ascribed this as much to the differential bioturbation of materials of varying ages as to active aggradation of the landform during the Holocene Epoch. Nonetheless, they segregated the archeological remains into upper (0–50 cm) and lower (50–120 cm) units in interpreting the site, with the upper unit representing Caddoan period occupations and the lower unit representing earlier occupations.

Based on the presence of stratified deposits, Prewitt and Associates conducted additional excavations in 1991 (Fields et al. 1993:83–140). The work focused on a 28-m² block placed to sample a ca. 100-cm-thick midden on the crest of the knoll; all excavated sediments were screened through ¼-inch mesh. The 18 cultural features identified consisted of 5 pit hearths, 5 other pits, 4 ash concentrations, 2 possible postholes, and 2 human burials.

The large artifact sample recovered contains 582 ceramic vessel sherds, 2 ceramic pipe fragments, 215 arrow points, 217 dart points, 703 other chipped stone tools, 155 cores, 21,809 pieces of unmodified debitage, 41 ground or battered stone tools, and 144 bone/shell tools or ornaments. The large (69.9 kg) faunal collection is quite diverse, and deer, turtles, rabbits, other small mammals, and mussels are the most common taxa. The collection of macrobotanical remains consists mostly of hickory nutshells, with *Pediomelum* rhizome fragments, acorns, squash

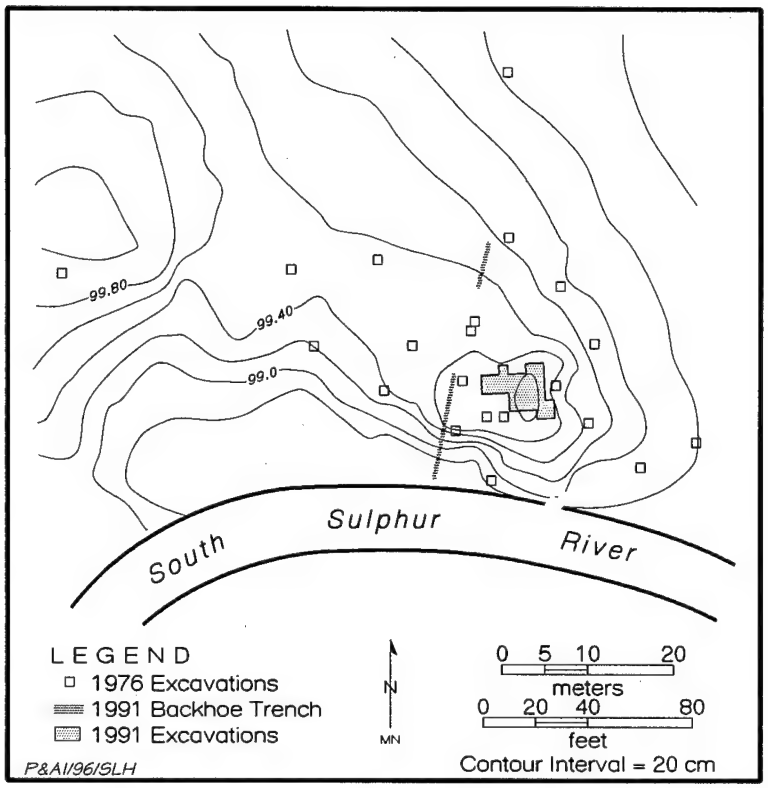


Figure 8. Plan of 41DT16 showing 1976 and 1991 excavations.

rind fragments, and seeds (vetch/peavine, *Rubus*, maygrass, sunflower, honey locust, grape, Cheno-am, knotweed, and hackberry) occurring less commonly.

The distributional evidence and the 12 radiocarbon dates (see Appendix B) led to the identification of two components. Occupations during the Woodland period (A.D. 0–800) were isolated as Analysis Unit 3/4, and early Caddoan occupations (A.D. 800–1200) were isolated as Analysis Unit 1/2; both are included in the assemblage analysis in Chapter 3. Sparse late Caddoan materials are present as well, but they could not be separated from the earlier remains.

L. O. Ray, 41DT21

The L. O. Ray site is situated in up to a meter of silty sediments, perhaps of colluvial origin, on a low rise near the north edge of the Middle Sulphur River floodplain. The site was recorded in 1962 when members of the Dallas Archeological Society learned of its existence from a local informant. Between May 1962 and April 1964, members of the Society excavated six test pits ranging in size from 3 x 3 ft (0.9 x 0.9 m) to 5 x 5 ft (1.5 x 1.5 m) into a midden on the largest of three rises. Five of the excavation units were contiguous, and the sixth was a short distance to the north. The excavations were done in 6-inch levels to depths ranging between 18 inches and 36 inches, and the matrix was screened through ½-inch and ¼-inch mesh screens. No cultural features were encountered, but an artifact sample consisting of 291 vessel sherds, 45 arrow points, 28 dart points, 24 other chipped stone tools, 4 pecked stones, 1 pitted stone, 1 celt, 12 bone tools, and 1 modified mussel shell was recovered; the lithic debitage recovered was retained but is not quantified in the report (Gilmore and Hoffrichter 1964). Faunal remains (mostly deer but also including bison, bird, opossum, lizard, skunk, wood rat, cotton rat, tree squirrel, turtle, raccoon, beaver, and mussel) and macrobotanical remains (mostly hickory nutshells) were also found but are not quantified in the report.

In 1970, Hyatt and Skinner (1971) revisited 41DT21 and observed cultural materials on the surface. They also received a report from L. O. Ray and J. Ray that their father had removed a human burial from the site. The area was next visited in 1990 by crews from Southern Methodist University (Jurney et al. 1993), who conducted a surface reconnaissance and excavated 11 shovel tests. Subsequent work showed that the area examined in 1990 was ca. 100 m north of the midden-capped rise tested by the Dallas Archeological Society, however.

The final episode of work occurred in 1991, when Prewitt and Associates excavated sixteen 1-x-1-m units by hand and mechanically stripped ca. 360 m² (Gadus, Fields, and Bousman 1992:35–47). Most of the units were in the northern part of the site where Southern Methodist University had found cultural materials in 1990, but four units and one of the stripped areas (covering 120 m²) were on the southern rise where the 1962–1964 excavations had taken place (Figure 9). Two cultural features—a shallow pit and a burned rock concentration—were found in the northern area, while a pit hearth was found on the southern rise. The artifacts recovered

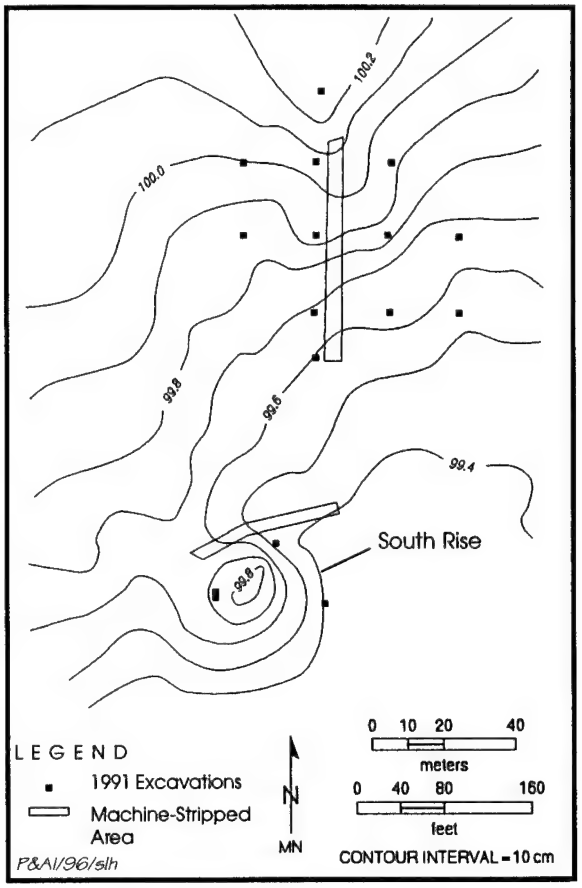


Figure 9. Plan of 41DT21 showing 1991 excavations; 1962–1964 excavations are not shown because precise locations are not known, but they apparently were on the South Rise.

consist of 103 ceramic vessel sherds, 29 arrow points, 4 dart points, 19 bifaces, 3 unifaces, 17 pieces of modified debitage, 595 pieces of unmodified debitage, 1 grinding slab, and 8 bone tools. Also recovered were 5 human bone fragments and 1 human tooth, mussel shells, and 1,799 animal bones; the best-represented faunal taxa are deer, turtles, and rabbits. The macrobotanical remains consist predominantly of hickory nutshells, although three charred *Chenopodium* seeds also were found.

Three radiocarbon assays were obtained, one of which apparently reflects modern contamination (see Appendix B). One assay of 1270 ± 80 B.P. from the pit hearth on the southern rise suggests that the midden in that area dates partly to the very late Woodland period or the early end of the Caddoan period. The other assay of 1045 ± 50 B.P. suggests that the northern part of the site is somewhat later, although still dating to the early Caddoan period. The diagnostic artifacts generally support these assessments, although they also point to a minor later component. The data from two of the units on the southern rise hinted at a Caddoan component superimposed on an earlier Woodland occupation, but review of the combined 1960s and 1991 data during this synthesis revealed that the early Caddoan materials heavily dominate the earlier remains. Because of this and because the combined collection from the 1960s excavations and the 1991 testing is sufficiently large to allow interpretation, the southern rise at 41DT21 is included in the Chapter 3 assemblage-level analysis. The northern rise is not included because the collection from that part of the site is much smaller and because the diagnostic artifacts suggest that early Caddoan and middle to late Caddoan remains in this area are mixed.

Ranger, 41DT37

The Ranger site is located on and adjacent to a low knoll on a terrace edge overlooking an intermittent stream which drains into the South Sulphur River (Figure 10). The terrace is probably at least Pleistocene in age, with the thin (10–40 cm) artifact-bearing deposits perhaps representing Holocene colluvial or eolian reworking of the older sediments. The primary investigation of the site, after its initial recording in 1970, was done in 1975 (Doehner and Larson 1978:69–86) and consisted of the excavation of a block of 36 contiguous (or nearly so) 2-x-2-m units centered on the knoll and 3 isolated 2-x-2-m units and 9 postholes just south of the knoll. The units were dug in 5-cm levels and generally were not screened. No cultural features were found. Reportedly recovered were 169 sherds, 6 arrow points, 59 dart points, 357 other chipped stone tools, 2,528 pieces of lithic debitage, and 4 ground stone tools. Because of soil conditions, faunal remains were not preserved. The single radiocarbon assay obtained, 270 ± 60 B.P. (see Appendix B), apparently reflects postoccupational contamination.

Based chiefly on the temporally sensitive artifacts and secondarily on the distributional evidence, the Ranger site was judged to date mostly to the late Woodland and early Caddoan periods (Doehner and Larson 1978:78). The excavators noted vague stratification in the cultural materials and used this to define two occupational zones, one at 0–15 cm and the other at 15–40 cm (Doehner and Larson 1978:70). Review of the Ranger site data in 1991 revealed that

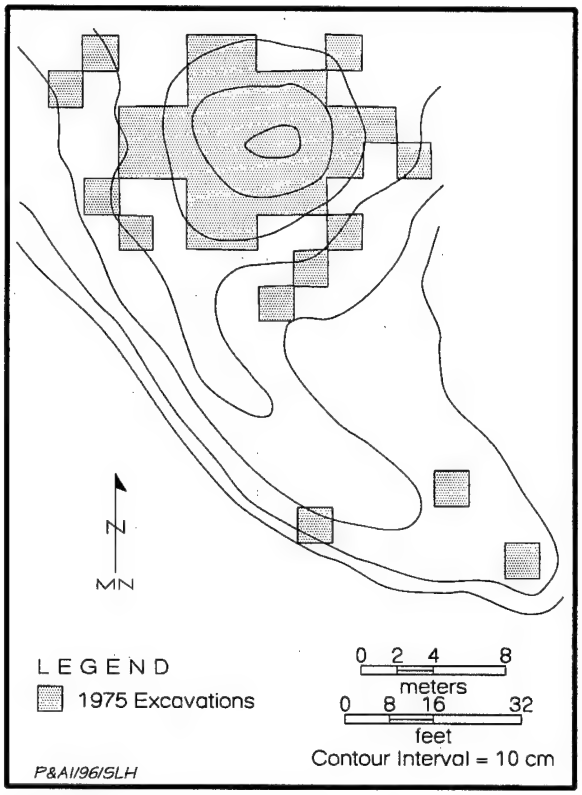


Figure 10. Plan of 41DT37 showing 1975 excavations.

the vertical distributional patterning in the artifact distributions is not sufficiently strong to allow components to be separated, however; instead, it appears that Woodland and Caddoan remains occur in mixed contexts in the thin Holocene deposits (Gadus et al. 1991:79–82). This, combined with the near lack of screening, is why 41DT37 is excluded from the Chapter 3 assemblage analysis.

Luna, 41DT52

The Luna site is located on the crest and slopes of a large, isolated remnant of a probable Pleistocene terrace overlooking the floodplain at the confluence of the Middle Sulphur and South Sulphur Rivers (Figure 11). The sediments containing the archeological remains vary from 20 to 100 cm in thickness and probably are colluvial in origin. The initial investigations after the site was first recorded in 1970 were performed in 1975 by Southern Methodist University and consisted of the excavation of seven isolated 2-x-2-m units, most of which were on the crest of the landform (Doehner and Larson 1978:50–57). These were excavated in 5-cm levels to depths of 20–55 cm, and the sediments removed were not screened. The reported collection from this phase of work consists of 76 sherds, 1 arrow point, 9 dart points, 80 other chipped stone tools, 23 cores, 1,154 pieces of lithic debitage, 1 ground stone, and a very small sample of faunal materials. No features were noted.

Southern Methodist University returned to the site in 1976, at which time 22 largely noncontiguous 2-x-2-m units were hand excavated and 4 trenches were excavated by backhoe (Doehner et al. 1978: 101–128). The hand-excavated units were dug in 10-cm levels to depths of 15–95 cm, and all sediments were screened through ¼-inch mesh. Most of these units were on the eastern end of the ridge. Two features interpreted as hearths or fire pits and one feature interpreted as a trash pit were recorded. A number of other anomalies were investigated as well; most of these appeared to be noncultural, although several are possible pits or postholes. Reportedly recovered were 940 sherds, 62 arrow points, 44 dart points, 445 other chipped stone tools, 104 cores, 14,175 pieces of lithic debitage, 2 ground stones, 4 pitted stones, 15 bone tools, and 8,821 animal bone fragments. Five radiocarbon dates were obtained (see Appendix B). The two from the hearth features are 160 ± 45 and 920 ± 40 B.P., while an assay of 1300 ± 150 B.P. was obtained from the upper fill of the trash pit. The other two assays, from nonfeature contexts, are 280 ± 70 and 660 ± 70 B.P.

Based on the temporally sensitive artifacts and distributional data recovered during the second excavation season, the Luna site was judged to have components dating to the late Archaic and Caddoan periods (Doehner et al. 1978:115, 127). The excavators noted some stratification in the cultural materials, especially in a restricted area with relatively thick deposits on the eastern part of the ridge. Of the three zones defined, the upper two (0–50 cm) were assigned to the Caddoan period, while it was suggested that the lowest (50–100 cm) represented late Archaic occupations. A subsequent reevaluation of the data (Gadus et al. 1991:82–86) concluded that Caddoan and Woodland components could be isolated using the materials from three units in the area with thick deposits (Test Units 15, 26, and 30), with Caddoan occupations represented in the upper 30 cm and Woodland occupations below this. Because components can be isolated, the artifact sample is sufficiently large to allow interpretation, and all the sediments were screened, this part of the

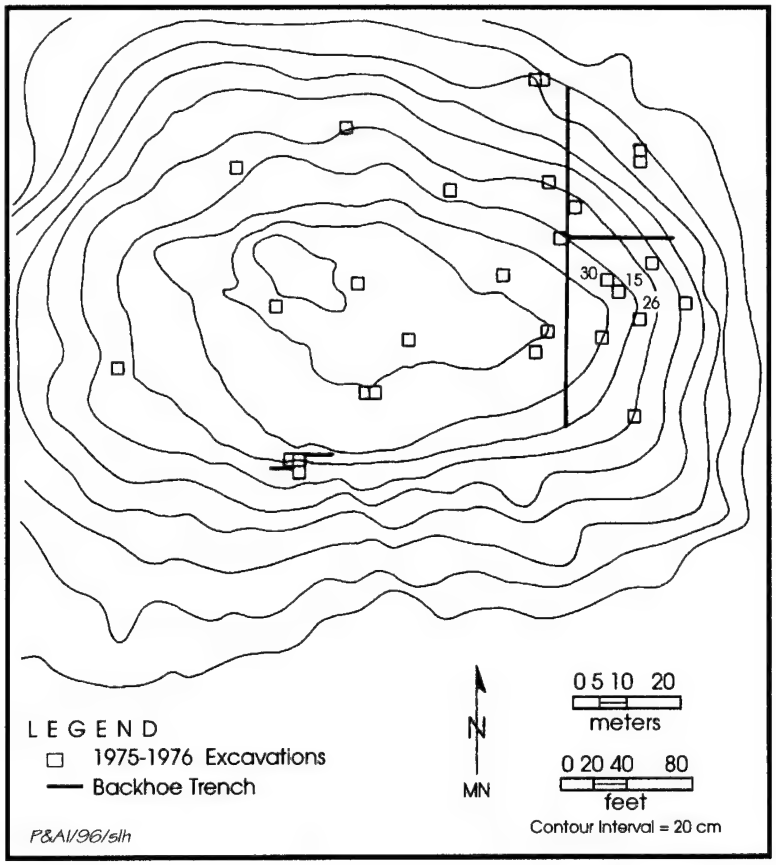


Figure 11. Plan of 41DT52 showing 1975 and 1976 excavations.

Luna site collection is included in the Chapter 3 assemblage analysis.

Johns Creek, 41DT62

The Johns Creek site sits in probable alluvial deposits up to 90 cm thick on a low knoll adjacent to Johns Creek on the floodplain of the South Sulphur River (Figure 12). The site was originally recorded in 1970, and in 1990 it was revisited and assessed though the excavation of 14 shovel tests. In 1991, a two-stage excavation program was implemented (Fields et al. 1993:141–164). The first stage involved the excavation of four 1-x-1-m units to determine if isolable components are present, and this was followed by the excavation of 16 additional units to form an 18-m² block on the crest of the knoll; the sediments from all units were screened through ¼-inch mesh.

No features were encountered, but a sizable artifact sample was obtained. The materials recovered consist of 11 arrow points, 65 dart points, 155 other chipped stone tools, 45 cores, 4,367 pieces of unmodified debitage, and 6 ground or battered stone tools. Almost no faunal remains were recovered, and the most notable materials in the small sample of macrobotanical remains are hickory nutshells, pecan nutshells, acorn shells, and a few fragments of wild plum pits.

The five radiocarbon assays obtained provide equivocal evidence about the chronology of the site (see Appendix B), but the diagnostic artifacts suggest that the primary occupations (as represented by Analysis Unit 3/4) occurred over much or all of the Woodland period, ca. 200 B.C.–A.D. 800. A light early Caddoan component is present in the upper deposits (Analysis Unit 1/2), but these later materials are mixed with artifacts from the Woodland occupations and could not be isolated. Thus, only the Analysis Unit 3/4 Woodland component is included in the assemblage analysis in Chapter 3.

41DT63

Site 41DT63 is situated in ca. 80 cm of alluvium on a low knoll on the north bank of the South Sulphur River (Figure 13). It was first recorded in 1970, and in 1990 it was reassessed through a surface reconnaissance and the excavation of seven shovel tests. The shovel tests identified organically enriched midden deposits containing well-preserved faunal and botanical remains as well as artifacts, and this led to formal testing in 1991 (Gadus, Fields, and Bousman 1992:65–73). The testing consisted of the manual excavation of three 1-x-1-m units; all sediments were screened through ¼-inch mesh. No cultural features were encountered, but 77 burned human bone fragments found scattered throughout one of the units may represent a disturbed burial. Also recovered were 87 ceramic vessel sherds, 18 arrow points, 7 dart points, 32 other chipped stone tools, 1 core, 357 pieces of unmodified debitage, 2 ground stones, 239 g of mussel shells, and 1,024 vertebrate faunal specimens (10 of which had been modified for use

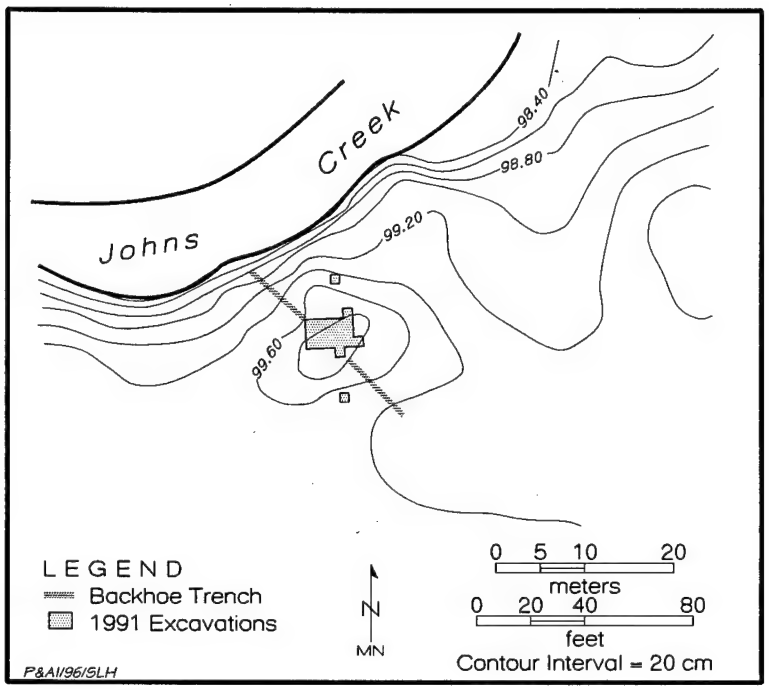


Figure 12. Plan of 41DT62 showing 1991 excavations.

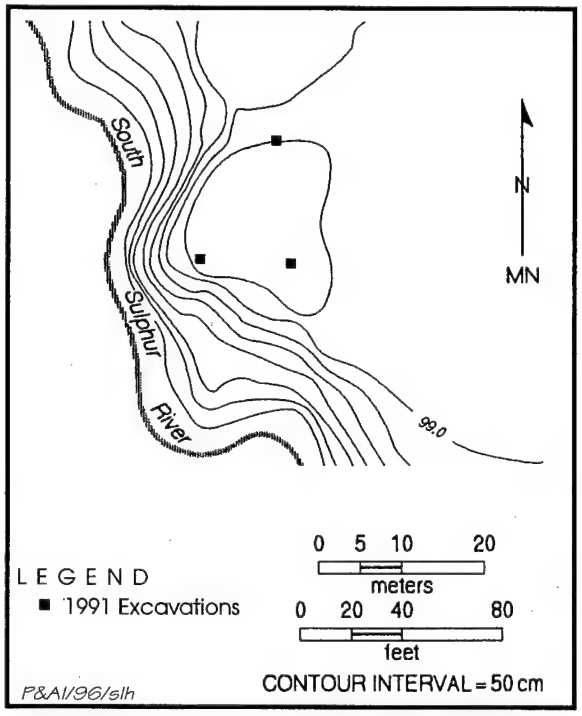


Figure 13. Plan of the southern part of 41DT63 showing 1991 excavations.

as tools). Deer was the most common taxon in the animal bones, although a variety of other taxa were represented as well. The sample of macrobotanical remains was small and consisted mostly of hickory nutshells.

Three radiocarbon assays of 930 ± 60, 1010 ± 90, and 1090 ± 100 B.P. were obtained (see Appendix B), suggesting that the midden dates to the early part of the Caddoan period. This was supported by most of the diagnostic artifacts, although a few suggested a minor late Caddoan component as well. While the sample of materials is small, 41DT63 is included in the Chapter 3 assemblage analysis because it has a single predominant component and is well dated.

Thomas, 41DT80

The Thomas site is located in thin (up to 69 cm) alluvium on a small floodplain rise ca. 100 m north of the South Sulphur River (Figure 14). The initial work by Southern Methodist University in 1972 consisted of the surface collection of eighty-four 2-x-2-m units and the excavation of six 1-x-1-m units, one of which was expanded ca. 0.25 m on two sides to expose a human burial (Hyatt et al. 1974: 72–87). The excavation units were dug in 5-cm levels, and all sediments were screened through ¼-inch mesh. Two cultural features were identified in addition to the human burial mentioned above. One of these, an ash-and-charcoal-filled pit, yielded radiocarbon assays of 1220 ± 350 B.P. from the upper portion and 1180 ± 220 B.P. from the lower portion (see Appendix B). The third feature identified was a concentration of sherds, cores, bifaces, bones, and burned rocks. The artifacts collected sitewide consist of 194 sherds, 26 arrow points, 6 dart points, 84 other chipped stone tools, 22 cores, 962 pieces of lithic debitage, and 5 ground stones. Well-preserved, though fragmentary, faunal remains (n = 834) also were recovered.

The second episode of work, also by Southern Methodist University, entailed hand excavation of one 2-x-8-m trench and one 1-x-14-m trench (Hyatt and Doehner 1975). Both were dug in 10-cm levels, and the sediments removed were not screened. The artifacts recovered consist of 132 sherds, 10 arrow

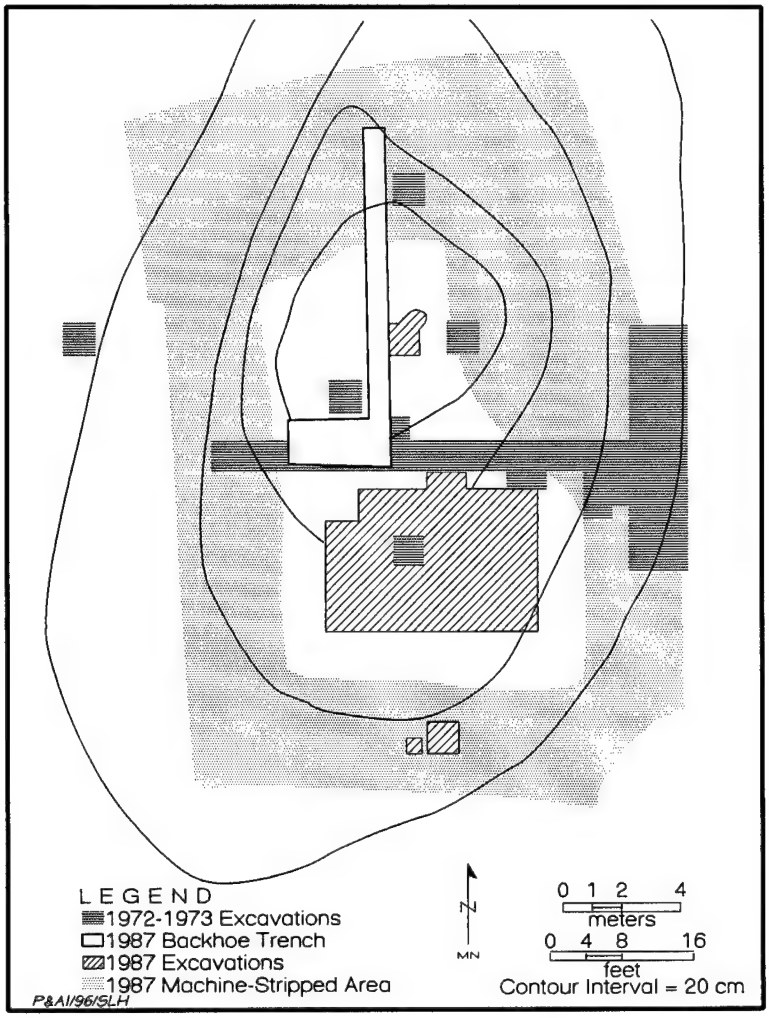


Figure 14. Plan of 41DT80 showing 1972–1973 and 1987 excavations.

points, 8 dart points, 32 other chipped stone tools, 345 pieces of lithic debitage, and 2 pecked or ground stones. Ten features—one human burial, three hearths, two trash concentrations, three mussel shell concentrations, and one burned rock concentration—were recorded.

The final episode of work occurred in 1987 and involved the excavation of one ca. 11-m-long backhoe trench, most of a 5-x-7-m block, two 1-x-1-m units, two 0.5-x-0.5-m units, and a bulldozer-scraped area of ca. 259 m² (Cliff 1989). Most of the hand-excavated units were dug in 10-cm levels, and the sediments were screened through ¼-inch mesh. A total of 57 features was recorded: 3 hearths, 19 large pits, 7 small pits/large postholes, 6 charcoal-filled pits/postholes, 18 postholes, and 4 burials. The reported artifact collection from this phase of work consists of 577 sherds, 128 arrow points, 27 dart points, 427 other chipped stone tools, 38 cores, 2,257 pieces of lithic debitage, 6 pecked and battered stones, and 149 bone tools. A large amount (n = 15,381) of faunal materials was collected as well as an unquantified amount of mussel shells. The faunal collection is quite diverse, with the most common taxa being deer, turtles, and rabbits. The collection of macrobotanical remains consists mostly of hickory nutshells, followed distantly by acorn shells, squash rind fragments, pecan nutshells, tuber and rhizome fragments identified as possible *Pediomelum*, maize, and seeds (sumpweed, vetch/peavine, *Chenopodium*, knotweed, bedstraw, sedge, and *Rubus*).

Based on the five radiocarbon dates obtained (see Appendix B) and the diagnostic artifacts, Cliff (1989:6-139 through 6-145) defined two primary Caddoan occupations, one dating to the early part of the period (A.D. 950–1200) and one being much later (A.D. 1600–1700). The data suggest that the former was by far the more intensive, with the later component apparently representing quite limited use. Because the vast majority of the remains represent a single early Caddoan component, 41DT80 is included in the Chapter 3 assemblage analysis.

Doctors Creek, 41DT124

The Doctors Creek site is located on a terrace edge overlooking Doctors Creek north of the South Sulphur River floodplain (Figure 15). The sediments containing most of the archeological remains may be primarily colluvial in origin, although an alluvial contribution is possible in the part of the site closest to the creek. The site was recorded in 1987 and then tested and excavated in the same year (Martin 1989a). The work involved the excavation of 11 backhoe trenches, a ca. 360-m² bulldozer-scraped area, ca. 40 shovel tests, fifty 0.5-x-0.5-m units, one 1-x-2-m unit, ca. six 0.5-x-1-m units, and two blocks of contiguous

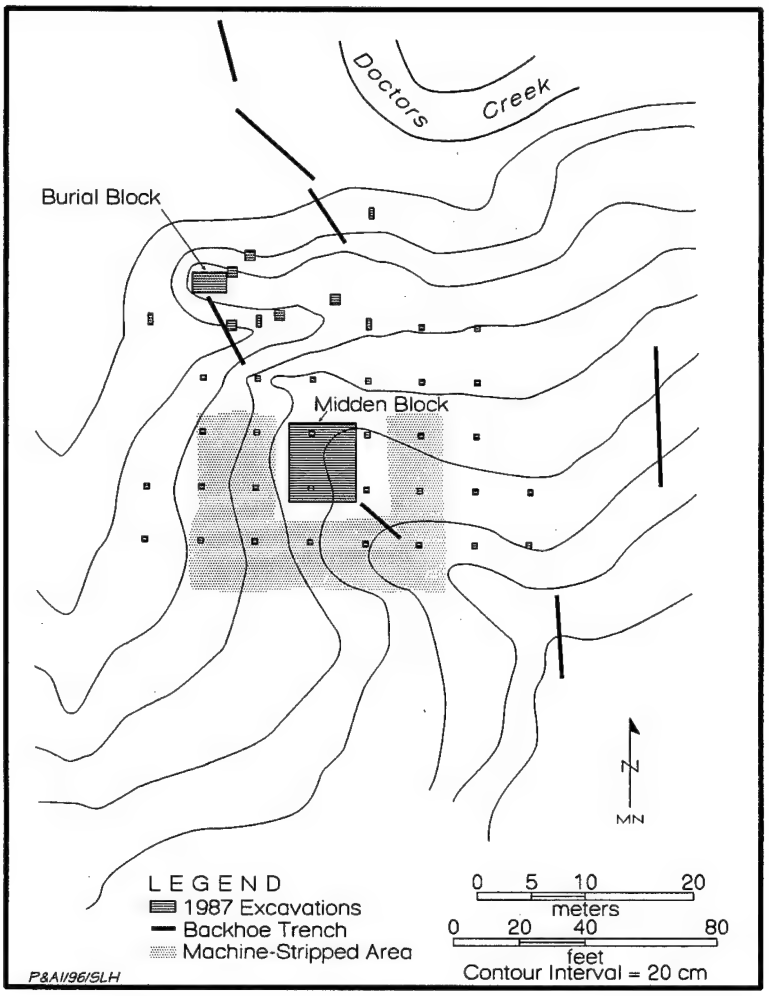


Figure 15. Plan of 41DT124 showing 1987 excavations.

units. One of the blocks, termed the Midden Block, measured 6 x 7 m, while the other, called the Burial Block, was 2 x 3 m. Most of the hand excavations were in 10-cm levels to depths of 5–115 cm, and the sediments removed were screened through ¼-inch mesh. Thirty-two features were discovered: 14 large pits, 12 postholes, 3 hearths, 2 burials, and 1 refuse concentration. The artifacts recovered consist of 784 sherds, 208 arrow points, 44 dart points, 594 other chipped stone tools, 103 cores, 5,088 pieces of lithic debitage, 1 ground stone, and 209 bone tools. Abundant faunal remains (ca. 17,000) also were recovered, with the most common taxa being deer, turtles, and rabbits. Most of the macrobotanical remains are hickory nutshells, with pecan nutshells, tuber and rhizome fragments identified tentatively as *Pediomelum*, squash rind fragments, acorn shells, maize, and seeds (sumpweed, vetch/peavine, *Chenopodium*, knotweed, bedstraw, *Rubus*, sedge, spurge, and bindweed) occurring in much smaller quantities.

Five radiocarbon assays were obtained from the Midden Block and two from the Burial Block (see Appendix B). These assays, the diagnostic artifacts, and the distributional evidence led Martin (1989a:7-105 through 7-110) to conclude that the primary occupation of the site, especially in the area of the Midden Block, occurred during the early Caddoan period (A.D. 950–1200), and this component is included in the assemblage analysis in Chapter 3. Some hints of use during the Archaic, Woodland, and later Caddoan periods were noted, but these materials could not be isolated from the preponderant early Caddoan cultural remains with any confidence.

41DT154

Site 41DT154 is situated on the north side of the South Sulphur River valley on an interfluve between two intermittent tributaries to Cannon Creek (Figure 16). The silty sediments containing the cultural materials are up to 70 cm thick and may be colluvial in origin, although they also could represent in situ weathering of the underlying bedrock formation. The site was recorded during a 1989 survey by Southern Methodist University, at which time 26 shovel tests and an exploratory backhoe trench revealed dense prehistoric remains. Formal testing was done in 1990 (Gadus et al. 1991:30–37). A 30-m-long backhoe trench was excavated across the center of the southwestern end of the landform, and a second trench, 10 m long, was excavated to the east of and perpendicular to the first trench. These trenches bisected the area of high artifact densities identified by the previous investigations. In addition, two 1-x-1-m units were excavated adjacent to the trenches. No evidence of cultural features was observed in the walls of the backhoe trenches or in the excavation units. The prehistoric artifacts

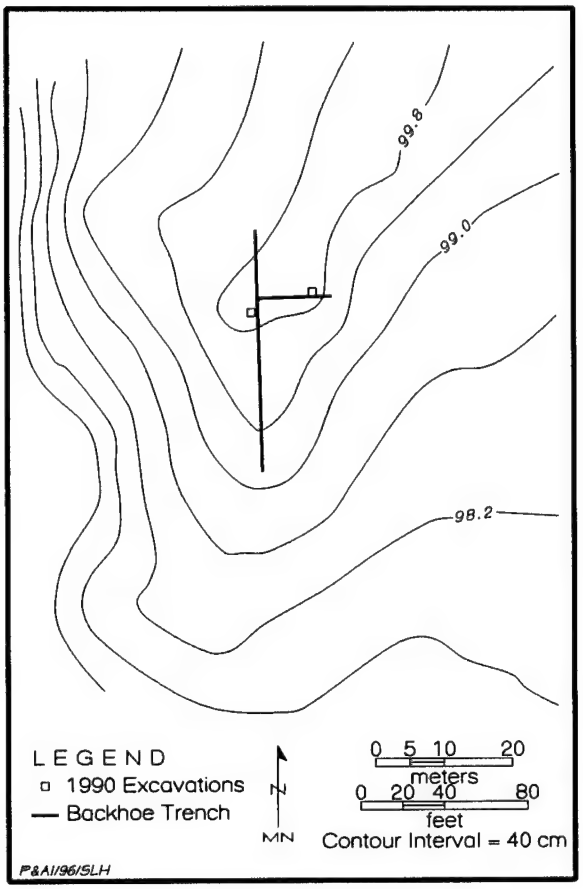


Figure 16. Plan of 41DT154 showing 1990 excavations.

recovered consist only of lithic materials: 12 dart points, 21 dart point fragments, 4 arrow point fragments, 26 bifaces, 17 cores and tested pebbles, 1 pitted stone, and 2,168 pieces of debitage. No faunal remains or macrobotanical remains were found, and no radiocarbon dates were obtained.

Despite the lack of dates and the limited excavations, the sample obtained from 41DT154 is useful because it appears to date mostly to the Woodland period and it is sufficiently large to permit meaningful comparisons. Some later materials are present (i.e., the arrow points), but they are few in number and not accompanied by ceramics suggesting substantial use during the Caddoan period. Because Woodland materials predominate heavily, 41DT154 is included in the Chapter 3 assemblage analysis.

Lawson, 41HP78

The Lawson site is located ca. 100 m south of the South Sulphur River on three rises atop a Pleistocene terrace remnant on an outside meander bend of the river (Figure 17). The sediments containing the archeological remains are generally thin (up to 45 cm); they are probably at least partly alluvial, although other depositional processes may be represented as well. The initial subsurface investigation after its initial recordation in 1970 consisted of the excavation of 22 isolated 1-x-1-m units (Hyatt et al. 1974). Eighteen of the units were placed on the largest of the three rises (Rise I), where two hearth features were recorded. One of these yielded a radiocarbon age of 2080 ± 60 B.P. (see Appendix B). Apparently, only the upper levels were screened, and the artifacts recovered consist of ca. 126 sherds, 10 arrow points, 15 dart points, 164 cores/bifaces, 106 other chipped stone tools, 4,580 pieces of lithic debitage, 3 ground stones, and ca. 400 bone fragments.

Work resumed more than a decade later with the 1986 excavation by the University of North Texas of three backhoe trenches and a number of shovel tests (Perttula 1988), again concentrating on Rise I. In 1987, Southern Methodist University returned to the site and extensively tested all three rises (Martin 1989b). Two of the 1986 backhoe trenches were lengthened and 10 new trenches were excavated. Rises I and II were investigated by mechanical scraping which exposed ca. 466 m² of the B horizon surfaces and the manual excavation of sixteen 1-x-1-m units and two 0.5-x-1-m units in 10-cm levels. Rise III was investigated with 23 shovel tests and two 1-x-1-m units, most of which were on the part of the terrace northwest of the levee. All of the matrix from the hand excavations was screened through ¼-inch mesh. Numerous cultural features were recorded: 18 large pits, 3 large roasting pits, 14 postholes/small pits, 6 human burials, and 1 hearth. The artifacts recovered consist of 297 sherds, 38 arrow points, 45 dart points, 602 other chipped stone tools, 5,561 pieces of lithic debitage, and 48 bone tools. A sizable faunal sample (n = 4,491) also was obtained; the most common taxa were deer, turtles, and rabbits. The small sample of macrobotanical remains is dominated by hickory nutshells, although pecan nutshells, acorn nutshells, squash rind fragments, and rhizome fragments identified tentatively as *Pediomelum* are also present. One burial yielded a radiocarbon age of 1810 ± 110 B.P., while two postholes yielded ages of 990 ± 40 and 960 ± 40 B.P. (see Appendix B).

Based on the temporally sensitive artifacts and the radiocarbon dates, Martin (1989b:9-88 through

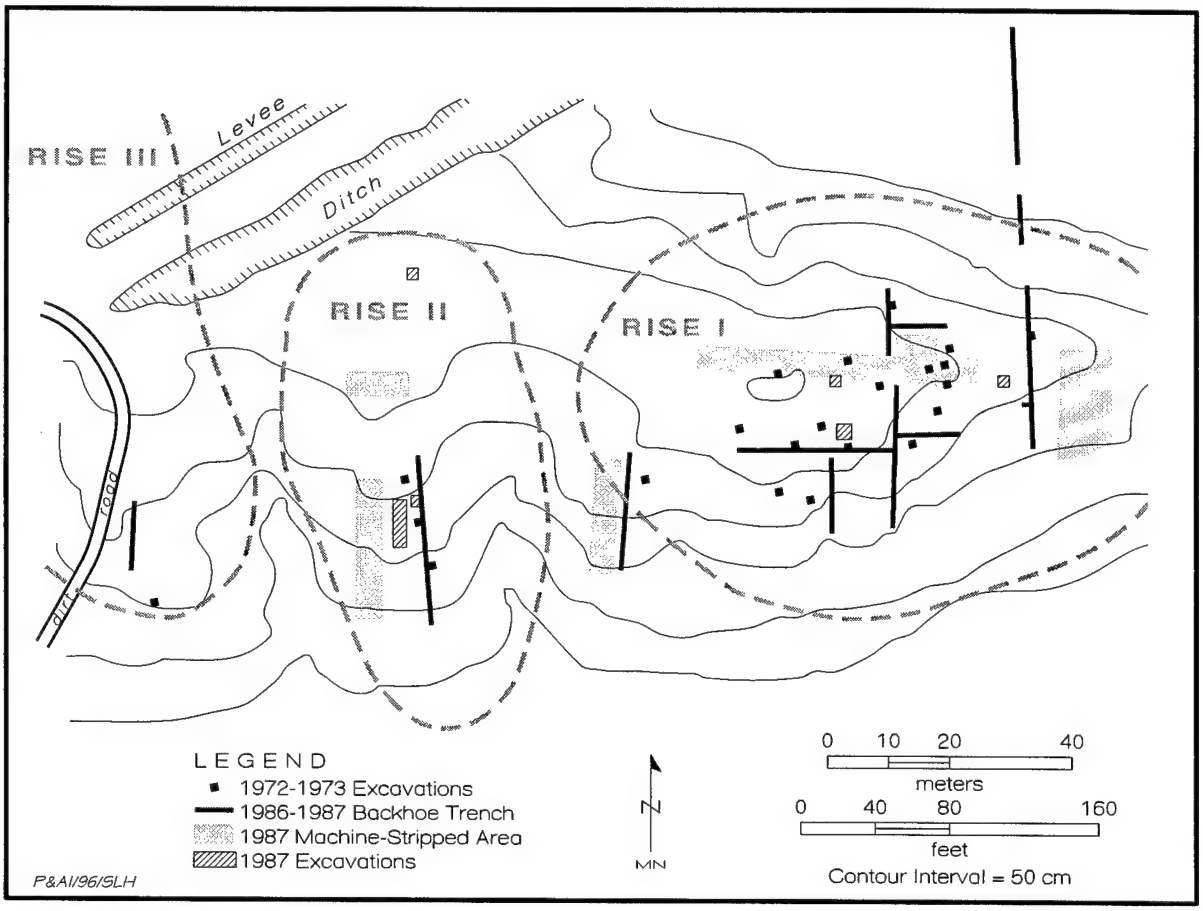


Figure 17. Plan of 41HP78 showing 1972–1973 and 1986–1987 excavations.

9-89) concluded that the Lawson site contains at least two components, one dating to the early Caddoan period and the other to the Woodland period; some hints of Archaic period use were noted as well. No evidence of vertical stratification was found, which Martin (1989b:9-73, 9-88) attributes to the nonaggrading nature of the landform. Some evidence for horizontal separation of the components is presented (Martin 1989b:9-84 through 9-87), but it is not sufficiently strong to allow components to be isolated. It is for this reason that the Lawson site is excluded from the Chapter 3 assemblage analysis. Nonetheless, 41HP78 is useful in a qualitative sense because of Martin's (1989b:9-68, 9-77 through 9-83) identification and dating (A.D. 900–1100) of possible early Caddoan structural remains and an associated midden on Rise I. This component probably is comparable to the other early Caddoan components at Cooper Lake, including those at the Manton Miller, Spider Knoll, Tick, and Spike sites.

Arnold, 41HP102

The Arnold site is located on a low rise in the South Sulphur River floodplain just east of Buggy Whip Creek (Figure 18). No detailed geomorphic investigations were carried out in the immediate vicinity of the site, but it is likely that it rests in overbank flood deposits, or possibly at the distal end of an alluvial fan. The site was recorded in 1970, and excavations were undertaken there in 1974 and 1975 (Doehner and Larson 1978:87–142). In 1974, 57 contiguous 2-x-2-m units were excavated on the eastern half of the rise. These were dug in 5-cm levels from the modern ground surface to depths ranging from 5 to 60 cm. The uppermost level in most units was screened through ¼-inch mesh, but the levels below apparently were not screened. A single unit was water screened in its entirety through mesh of unspecified size. The 1975 excavations focused on the western half of the rise; 51 contiguous

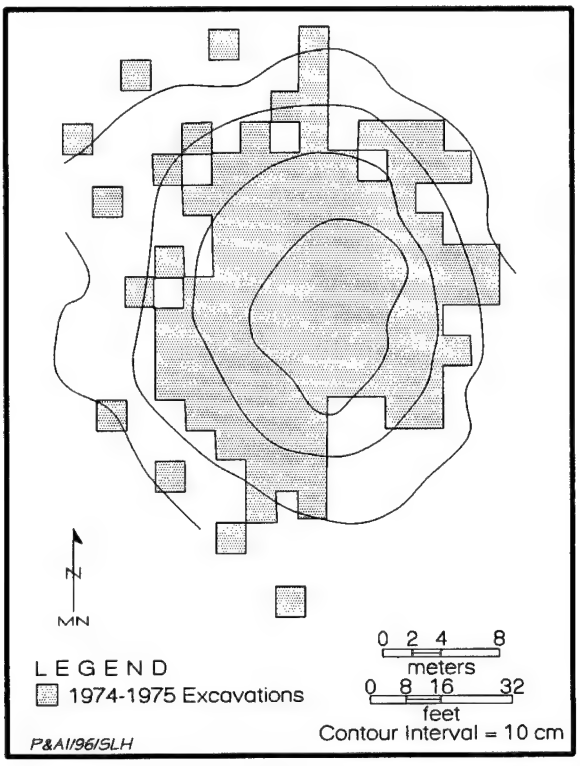


Figure 18. Plan of 41HP102 showing 1974 and 1975 excavations.

units, most measuring 2 x 2 m, and 7 isolated 2-x-2-m units were excavated.

As presented in the report (Doehner and Larson 1978:91), the 1975 excavations were on the same grid as the 1974 excavations, with the two blocks being separated by a ca. 0.5-m-wide balk. A review of the field notes in 1991 revealed that this was not the case, however, with the eastern edge of the 1975 excavations overlapping the western edge of the 1974 block (Gadus et al. 1991:86–96). It appears that there was ca. 0.5 m of overlap in the southern part of the site and ca. 0.1 m of overlap in the north-central portion, and thus it is likely that the two grids were oriented slightly differently. Based on this reconstruction, it appears that most of the easternmost units in the 1975 block actually measured less than 2 m east-west. It also is clear that the 1975 grid was shifted slightly south, probably about 0.3 m, of the 1974 grid.

The 1975 excavations commenced with the mechanical removal of the upper sediments across the western part of the site. The controlled excavations below the bladed surface were done in 5-cm levels, but it is clear from the notes that an acceptable vertical reference system was never established during the 1975 work. While an attempt was made after the completion of the fieldwork to relate the manually excavated levels to the pre-excavation ground surface (and hence to each other), it is not clear how this was done. As a result, there are no fully reliable data on the vertical distributions of the cultural remains in the 1975 excavations. A single unit was water screened through mesh of unspecified size, but there is no indication that any levels in any of the other units were screened.

The cultural features reportedly uncovered during the two seasons of work consist of 33 generally thin, often basin-shaped areas of oxidized clay or concentrations of burned clay and ash interpreted as hearths; 13 human burials; 3 dog burials; 5 animal bone concentrations; 3 mussel shell concentrations; 1 sherd concentration; and 4 soil anomalies interpreted as trash pits. The 1991 review of the field notes suggested that two additional hearths, one additional burial, one fewer dog burials, two fewer bone concentrations, and one additional pit actually were recorded. The reported artifact collection from this site is correspondingly large, consisting of 1,438 sherds, 283 arrow points, 118 dart points, 1,425 other chipped stone tools, 677 cores, 13,931 pieces of lithic debitage, 49 ground stones, and 187 bone tools. The reported faunal collection includes a large number of animal bones (n = 83,408) as well as mussel shells; the predominant vertebrate taxon is deer, although a variety of other mammals, fish, amphibians, reptiles, and birds are also represented. Recent inspection of a small number of fine-screen samples resulted in the identification of hickory and pecan nutshells, acorn shells, tuber fragments, and squash rind fragments (Crane 1993).

Eighteen radiocarbon assays were obtained from the site (see Appendix B), most clustering in the early part of the Caddoan period (A.D. 900–1200). Based chiefly on these radiocarbon dates and secondarily on the temporally sensitive artifacts, Doehner and Larson (1978:126, 138, 157) concluded that most of the archeological remains represent early Caddoan occupations, with less-conspicuous later Caddoan and Woodland components being present as well. The vertical distribution of the cultural features was used to define two occupational zones beneath the plow zone, one at 15–35 cm and one at 35–50 cm (Doehner and Larson 1978:93), but the temporal relationships between these were not determined and the utility of these units is questionable.

The 1991 review of the Arnold site data resulted in revised component definitions for the part of the site on the knoll crest, with the upper component extending to ca. 25 cm and the lower component occurring at greater depths. These deposits appear to date primarily to the early part of the Caddoan period and perhaps into the middle part, but there are also some materials dating to the late Caddoan period. Artifacts reflecting occupations during the late Woodland period also are present, and while they are most heavily concentrated in the northern part of the site, they are not clearly separable from the Caddoan period remains. The Arnold site was used in an intensive fashion, and its primary occupation may have been comparable to those at the other intensively used early Caddoan sites (e.g., Manton Miller, Tick, Spider Knoll, Spike, Thomas, Doctors Creek, and Thomas). Ultimately, however, the value of the data for assemblage-level analysis is compromised by the incongruities between the 1974 and 1975 grids, the mechanical removal of most of the upper deposits in the 1975 block, the problem of relating the 1974 and 1975 vertical reference systems, the lack of consistent screening, and the inability to isolate components. It is for these reasons that Arnold is excluded from the analysis presented in Chapter 3.

Cox, 41HP105

The Cox site is situated in up to 50 cm of Holocene alluvium on a low rise in the South Sulphur River floodplain (Figure 19). The site was discovered during the 1970 survey, and it was tested initially by Southern Methodist University in 1972, at which time two hundred sixty-four 2-x-2-m units were surface collected and four 2-x-2-m units were hand excavated (Hyatt et al. 1974:24–57). The excavations were done in 10-cm levels, but it is unclear if the matrix was screened consistently (McGregor et al. 1989:3-75). No cultural features were recorded; however, concentrations of burned rocks, charcoal, and mussel shells were noted. The artifacts recovered consist of 237 sherds, 60 arrow points, 105 dart points, 1,473 other chipped stone tools, 302 cores, 20,861 pieces of lithic debitage, and 21 ground/pecked/pitted stones. Faunal remains (n = 4,545) also were recovered, as were 2,262 historic artifacts.

Southern Methodist University returned in 1973, excavating six 2-x-2-m units by hand and machine

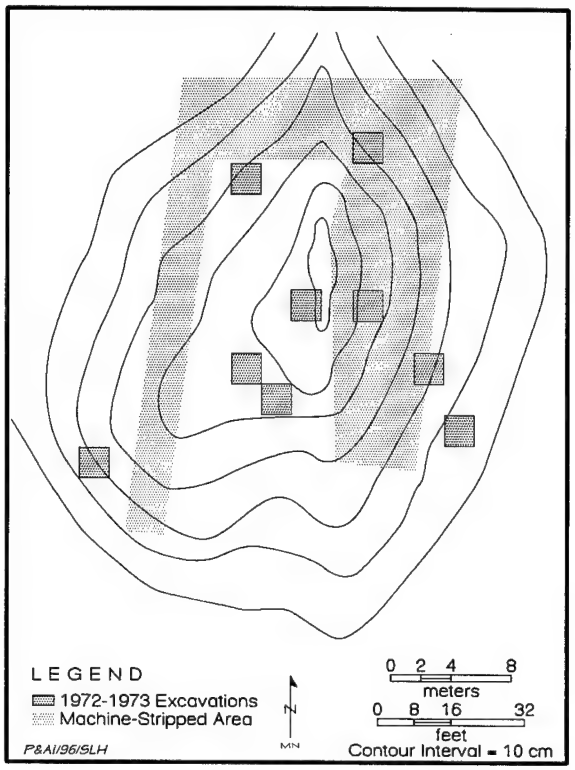


Figure 19. Plan of 41HP105 showing 1972–1973 excavations.

stripping a 212-m² area. The hand excavations were done in 10-cm levels, and the matrix apparently was screened through ¼-inch mesh. Seven cultural features were identified, consisting of three human burials, two hearths, one circular pit filled with mussel shells, and one fairly circular feature lined with a 15–24-cm-wide hard-packed clay ridge. The artifacts recovered consist of 102 sherds, 14 arrow points, 55 dart points, 612 other chipped stone tools, 8,828 pieces of lithic debitage, 2 ground stone tools, and 1 bone fish hook. Faunal materials were not quantified, and it is unclear if they were collected. One radiocarbon sample was obtained, yielding an age of 1110 ± 120 B.P. (see Appendix B).

Based on the evidence of cultural stratification and the temporally sensitive artifacts, both sets of excavators (Hyatt et al. 1974:57; Hyatt and Doehner 1975:35) concluded that the Cox site has two major components, one dating chiefly to the early part of the Caddoan period and the other dating earlier (termed Archaic but more probably Woodland). The earlier excavations suggested that this break occurs at a depth of 20 cm, while the later excavations suggested that Caddoan materials occur to 30 cm. Given the geomorphic setting and the hint of cultural

stratification noted above, it appears that the archeological remains at the Cox site may be isolable into reasonably discrete components dating to the Caddoan and Woodland periods. Unlike the other sites that were excavated in the 1970s, however, there have been no recent attempts to review the original data and determine if components can indeed be isolated and, if they can, to evaluate sample sizes. Because of this and because of uncertainties about the extent of screening in 1972, the Cox site is not included in the Chapter 3 assemblage analysis. It remains an untapped, potentially valuable source of information.

Hurricane Hill, 41HP106

The Hurricane Hill site is located on a series of interfluves overlooking the South Sulphur River floodplain (Figure 20). The sediments in this upland setting are generally thin and probably mostly colluvial in origin. The site was investigated by the University of North Texas in 1986 and 1987 (Perttula 1988, 1990a). A total of twenty 1-x-1-m units was hand excavated, 389 m^2 were excavated in several block units, 1,600 m^2 were machine stripped, 20 trenches were excavated by backhoe, and ca. fifty-five 0.3-x-0.3-m shovel tests were excavated. The 1-x-1-m units were dug in 5- and 10-cm levels, and all matrix was screened through ¼-inch mesh; quadrants of some units were screened through 1/16-inch mesh. Excavations other than the machine stripping were to depths of ca. 60–70 cm. According to Perttula (1990a:99), 229 cultural features were documented. Of these, 52 were classified as pits (33 large and 19 small), 21 as human burials (this excludes Burial 18 which was reported by a local collector to have come from the site), 1 as a dog burial, 142 as stains/postholes, 6 as hearths, 2 as nonpit concentrations of cultural materials, 4 as organic-rich pits, and 1 as a possible historic feature. The artifacts recovered consist of over 8,800 sherds, 42 ceramic pipe fragments, 109 arrow points, 616 dart points, 2,663 other chipped stone tools, 379 cores, almost 125,000 pieces of lithic debitage, 43 ground/battered stone tools, and 61 bone/shell tools and ornaments. A sizable collection (ca. 50,000) of faunal materials also was obtained, consisting mostly of the remains of turtles, rabbits, deer, and fish. The macrobotanical remains identified from a sample of the features consist of hardwood nutshells (hickory, Juglandaceae, hazelnut, and acorn) and small quantities of maize and cucurbits. The nine thermoluminescence assays on ceramics yielded dates of A.D. 1020 ± 120, 1050 ± 200, 1090 ± 100, 1210 ± 90, 1250 ± 170, 1300 ± 50, 1320 ± 90, 1370 ± 100, and 1540 ± 60; a single archeomagnetic date of A.D. 1300 ± 50 was obtained from a hearth.

Based on the stratigraphic evidence, the temporally sensitive artifacts, the thermoluminescence and archeomagnetic dates, and the horizontal distributions, Perttula (1990a:149–163) identified primary components dating to the middle part of the Caddoan period and the Woodland period. Less-substantial components dating to the late Archaic and early Caddoan periods were identified as well, and artifacts suggestive of use during earlier periods and during the late Caddoan period were noted. The Woodland component was thought to be represented by two middens, one of which contained a small cemetery perhaps associated with an adjacent locus of domestic activities. These remains were interpreted as indicating multiseasonal, although not year-round, use for residential purposes. The primary Caddoan component was represented by two houses in one part of the site and three in another, with both areas probably also containing extramural features such as drying racks and brush arbors; this feature evidence indicated that 41HP106 was used for residential purposes by perhaps two households on a year-round basis during part of the Caddoan period.

Since only a draft report containing limited primary data had been produced and the artifacts from the site had not been separated by component at the time this synthesis was done, not all of the information from the site could be integrated into the assemblage-level analysis presented in Chapter 3. Further, the original assessment of the chronology of the site was made with only limited thermoluminescence and archeomagnetic evidence, making it difficult to determine how this site relates to others. It is for this reason that 15 radiocarbon dates were obtained from the site during this synthetic study (3 additional dates have since been obtained as part of completing the analysis and reporting of the data). As explained in Chapter 3 and Appendix C, the new dates have clarified many aspects of the chronology of the site. Most importantly, they show that there were two primary Caddoan components dating to the early and middle parts of the period, as well as a strong Woodland component.

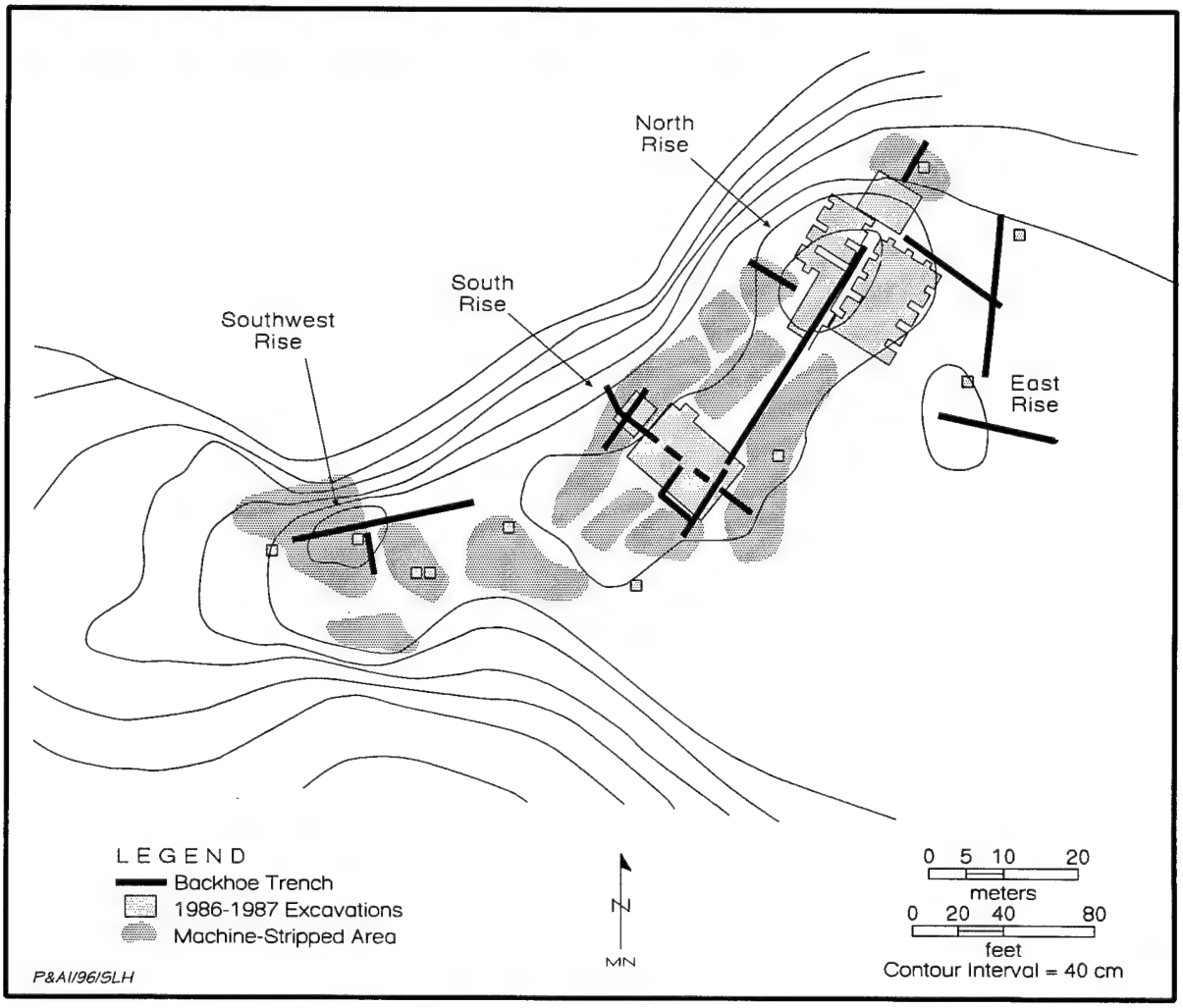


Figure 20. Plan of 41HP106 showing 1986 and 1987 excavations.

41HP137

Site 41HP137 is located at the toe of an upland ridge overlooking the floodplain of the South Sulphur River (Figure 21). The thin (10–25 cm) sediments containing the archeological remains may be primarily colluvial in origin. The work at this site was conducted by Southern Methodist University (McGregor 1989) and consisted of the initial excavation of eight shovel tests followed by the excavation of twenty 0.5-x-0.5-m units, three 0.3-x-0.3-m units, and a 20-m² block. The block was excavated in 10-cm levels, and the matrix was screened through ¼-inch mesh. Two probable pit hearths and 1 possible posthole were found, as were 12 sherds, 22 arrow points, 44 dart points, 64 other chipped stone tools, 36 cores, and 2,542 pieces of lithic debitage. No faunal remains were recovered, but the site did yield an interesting collection of botanical remains from a hearth feature that was dated to the Woodland period. This collection consists of hickory nutshells, cultivated squash rind fragments, acorn shells, and tuber and rhizome fragments identified tentatively as *Pediomelum* (McGregor 1989:8-15). Two radiocarbon samples were obtained, one from each of the probable hearth features; the ages are 2090 ± 30 and 1460 ± 60 B.P. (see Appendix B).

Based on the radiocarbon dates and the temporally sensitive artifacts, McGregor (1989:8-27) concluded that 41HP137 contains two major components, one dating to the early part of the Woodland period and the other dating to the terminal Woodland and/or very early Caddoan period. While some vague

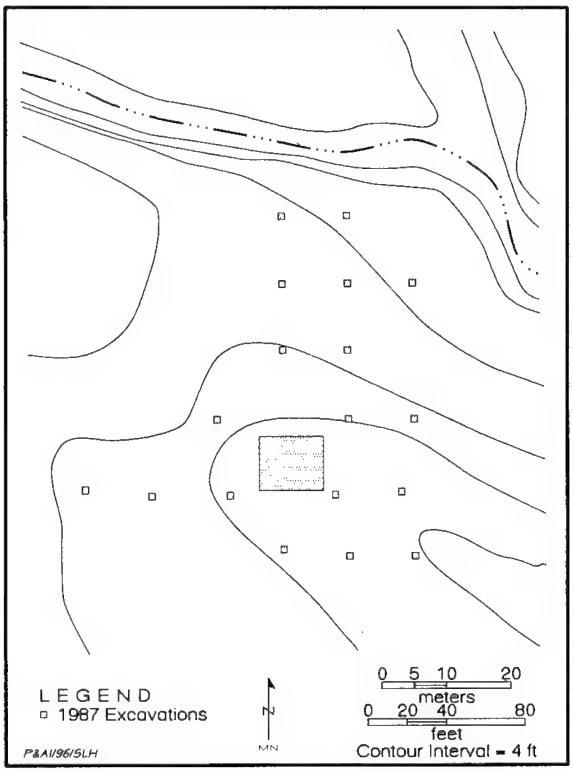


Figure 21. Plan of 41HP137 showing 1987 excavations.

hints of both vertical stratification and horizontal separation of the materials were noted (McGregor 1989:8-20 through 8-25), the patterns were not sufficiently clear to allow isolation of the components. Given the setting of the site in thin, eroding Holocene deposits on a very old landform and considering the occurrence of multiple components, including perhaps a later Caddoan component than that identified in the report, it is not surprising that the materials representing the various components could not be isolated. Because of this uncertainty about the extent to which materials from these components are mixed, 41HP137 is not included in the Chapter 3 assemblage-level analysis. Its most enduring importance lies in its collection of Woodland plant remains.

Finley Fan, 41HP159

The Finley Fan site, which is located along Finley Branch south of the South Sulphur River near the valley wall (Figure 22), is situated in the upper 2 m of a Holocene alluvial fan that exceeds 6 m in thickness. The initial work was performed in 1989 and consisted of the excavation of numerous backhoe trenches and four 1-x-1-m units (Jurney and Bohlin 1993:108–113; Jurney et al. 1993). Not all of the excavations were done in a controlled manner, and not all of the sediments removed were screened. Two burned rock features were encountered, one of which yielded a radiocarbon age of 4800 ± 90 B.P. (see Appendix B). These investigations yielded ca. 300 artifacts, 2 of which are dart points, and a small collection of macrobotanical remains containing hickory nutshells and tuber fragments (cf. *Pediomelum*).

Because the 1989 work showed that 41HP159 is one of the rare sites at Cooper Lake with discrete, stratified Archaic components, the site was subjected to more-intensive excavations early in 1990 (Gadus, Fields, Bousman, and Howard 1992). The work consisted of the manual removal of three isolated 1-x-1-m units, a 25-m² block sampling the upper cultural deposits, and a 25-m² block sampling the lower cultural deposits. All of the sediments removed were screened through ¼-inch mesh. In addition, heavy machinery was used to sample deeply buried deposits beneath the blocks and to strip off parts of the site searching for features. A total of 10 features, all consisting of rock concentrations, were recorded. The artifact collection consists of 37 dart points, 372 other chipped stone tools, 94 cores, ca. 3,344 pieces of unmodified debitage, and 14 ground and/or battered stones. Very limited faunal and macrobotanical remains were recovered because of poor preservation.

The 11 radiocarbon assays obtained, 6 of which are on soil humates and 5 of which are on charcoal (see Appendix B), suggest that the site dates to the middle and late parts of the Archaic period (4500–200 B.C.). The distributional evidence allowed four components to be isolated. The more substantial later two (Analysis Unit 1/2) apparently date to the late Archaic period, while the two earlier middle Archaic components (Analysis Unit 3/4) represent more-limited use. Finley Fan remains the sole extensively excavated site at Cooper Lake where Archaic components uncontaminated by later deposits have been found, and it provides the data for the Archaic period in the Chapter 3 assemblage analysis.

Peerless Bottoms, 41HP175

The Peerless Bottoms site is a ca. 20-cm-thick cultural deposit buried beneath ca. 70 cm of sterile sediments within an alluvial fan along Finley Branch

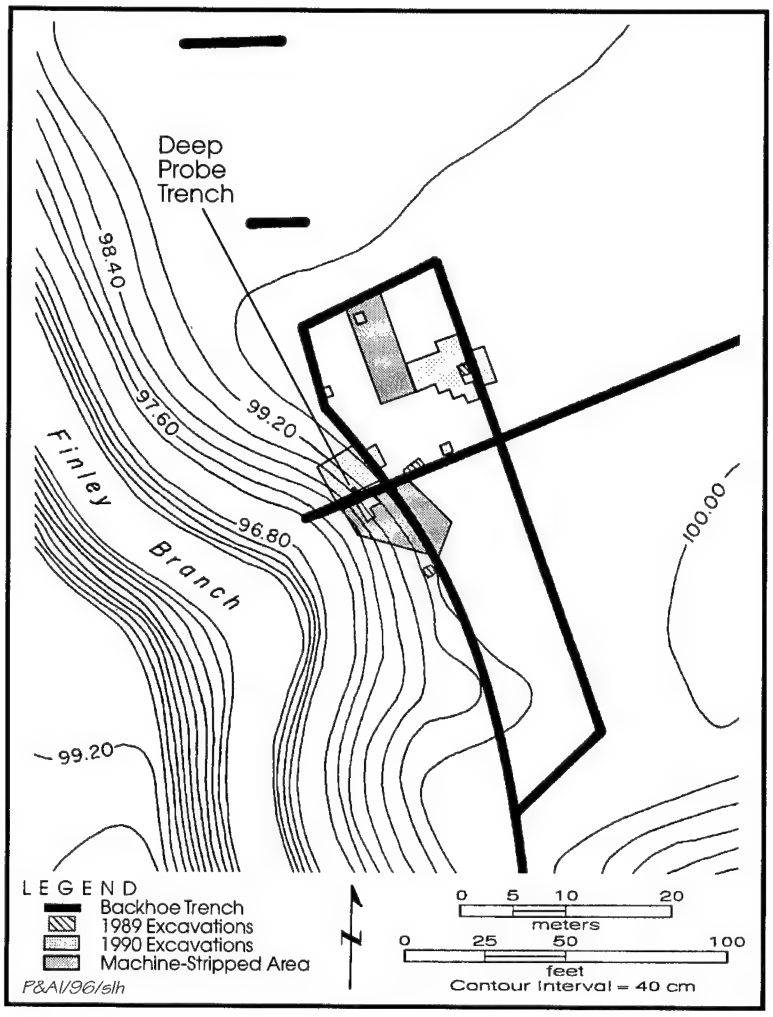


Figure 22. Plan of 41HP159 showing 1989 and 1990 excavations.

on the south side of the South Sulphur River floodplain (Figure 23). The site was discovered in 1989 when artifacts were observed during trenching aimed at finding buried sites (Jurney and Bohlin 1993:157–162). Two 0.5-x-0.5-m test pits and four 1-x-1-m units were excavated to sample the deposits. Three of these units and screening of some of the trench backdirt yielded 289 chipped stone artifacts and 145 sherds, with the temporally sensitive arrow points and ceramics indicating a late Caddoan component. Because late Caddoan components are infrequent at Cooper Lake and 41HP175 was in a discrete, stratified context, it was recommended for additional work.

Extensive excavations were done in 1991, consisting of the manual excavation of a 68-m² block and 27 isolated 1-x-1-m units, machine stripping of ca. 78 m², and the excavation of 28 backhoe trenches (Fields et al. 1993:165–226). The excavations located 5 potential cultural features (1 hearth and 4 possible posts or stakes) and recovered a large artifact sample consisting of 1,947 ceramic vessel sherds, 7 pipe fragments, 1 ceramic bead, 126 arrow points, 4 dart points, 360 other chipped stone tools, 219 cores, 13,365 pieces of unmodified debitage, 29 ground or battered stones, 1 celt, and 22 bone tools and ornaments. Faunal remains were not well preserved, and only a small collection (565 g) was recovered. The best-represented taxa are deer and turtles. The collection of macrobotanical remains consists mostly of hickory nutshells, with *Pediomelum* rhizome fragments, honey locust and water locust seeds, pecans, acorns, black walnuts, hackberries, squash rind fragments, and maize cupules occurring less commonly.

The 11 radiocarbon dates obtained (see Appendix B) and the artifactual evidence indicate that 41HP175 dates primarily to the late Caddoan period, probably ca. A.D. 1400–1500. Peerless Bottoms is the only extensively excavated site at Cooper Lake dating to this interval, and it provides the late Caddoan data used in the Chapter 3 assemblage analysis. The distributional evidence suggests that the area sampled represents a hearth-centered outside activity area associated with an undiscovered structure.

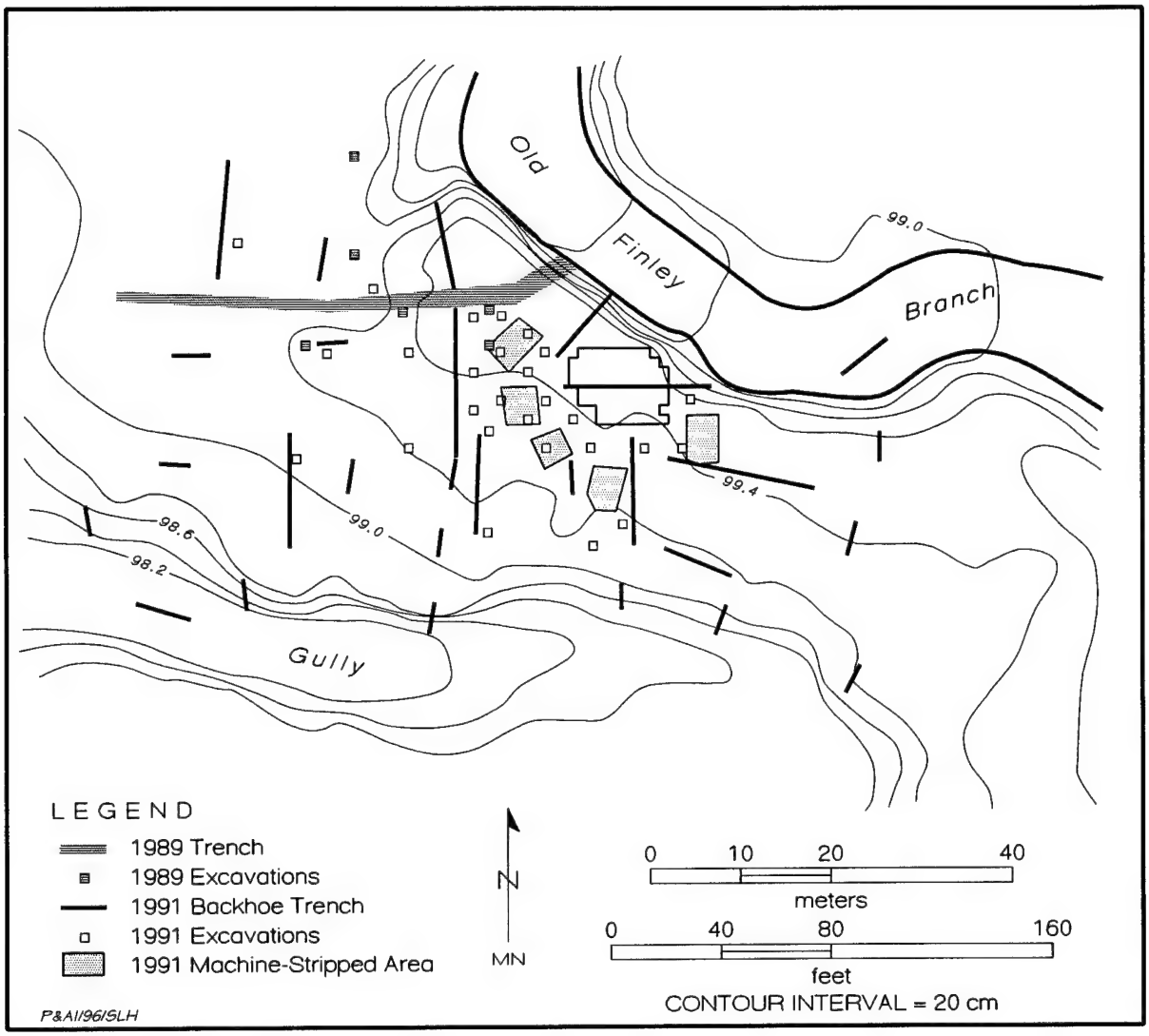


Figure 23. Plan of 41HP175 showing 1989 and 1991 excavations.

SYNTHESIS OF THE PREHISTORIC ARCHEOLOGY

3

INTRODUCTION

This synthesis of the prehistoric archeology of Cooper Lake is organized topically into the five research themes of cultural chronology, paleoenvironments, settlement strategies, subsistence, and sociocultural interaction. These topics are useful for this purpose because they are sufficiently broad that they can encompass a wide variety of specific research questions. Further, they formed the core of the research design prepared by Southern Methodist University in 1988 (Moir and Jurney 1988), and hence they have guided much of the work on the prehistoric sites since then.

While some parts of this synthesis are intended to be inclusive (e.g., Figure 24 below shows all radiocarbon dates, and the feature data from the Hurricane Hill site are incorporated even though artifact assemblages have not yet been isolated into components), other parts focus on the 12 sites (8 mitigated and 4 tested) where components can be isolated with relative confidence and dated (either through absolute or relative means) and where sufficient quantities of artifacts were recovered to permit assemblage-level interpretations. While focusing the analysis in this way means that a substantial amount of the information recovered from Cooper Lake is omitted from this synthesis (including the data from several of the intensively investigated sites), it has the benefit of maximizing the quality of the information used for interassemblage comparisons. The objective of this strategy is to increase the confidence of the conclusions, given that complete reanalysis of all information from the project area was not feasible.

The first step in the analysis consisted of reviewing all of the mitigated and tested sites to determine which ones should be included. This entailed compiling data on the extent of the excavations, whether the excavations were done in a controlled fashion (i.e., dug in levels and the sediments screened), the quantities of artifacts recovered (especially ceramics, arrow points, and dart points), evidence for stratification, and radiocarbon dates. Based on this information, eight mitigated sites—41DT6, 41DT11, 41DT16, 41DT62, 41DT80, 41DT124, 41HP159, and 41HP175—were determined to have artifact collections of sufficient quality to permit inclusion in the assemblage analysis. Excluded were the following: 41HP78 and 41HP137 because they contain mixed deposits; 41DT37 because it has mixed deposits and was not screened; 41DT1 because it has mixed deposits and because the initial excavations used ½-inch screens and did not retain unmodified debitage; and 41HP102 because the various problems with how it was dug confound any attempts to isolate components (see Chapter 2). Also excluded was 41HP105 since the extensive work needed to separate this large collection into components was beyond the scope of this project. Site 41HP106 presented a difficult problem because, while it had yielded important and abundant information, it had not been completely analyzed or reported. The radiocarbon dating done during this project solved part of this problem in that it clarified the chronology of the site sufficiently to allow the feature data to be incorporated into the synthesis. The artifacts could not be incorporated, however, because assemblages representing definable components have not been separated in the large collection of Archaic, Woodland, and Caddoan materials, especially for the North Rise and South Rise. Even on the Southwest Rise, where the artifacts may represent mostly Woodland occupations (Perttula 1995:144), there are uncertainties about how discrete the component is since some

Caddoan artifacts and features are present and two of the radiocarbon dates indicate occupations during the late Archaic period (see Appendixes B and C).

For the tested sites, 9 were dropped from the analysis because the excavated sediments were not screened, or it is unknown if they were screened. An additional 20 sites were excluded because the excavations were not done in levels (preventing isolation of components, assuming multiple ones are present), and they lack convincing evidence that they have single components. This left 28 candidates for inclusion (Table 3). Of these, 20 were ruled out because they clearly have mixed deposits, because insufficient descriptive and/or distributional data are reported to allow confident evaluations of their components, because they occurred in deposits so thin that there is no potential for stratified cultural remains, or because diagnostic artifacts are so few (e.g., fewer than 10 projectile points from controlled excavations) that their chronologies are ambiguous or unknown. The remaining 8 sites have the best potential of all the tested sites to contribute assemblage-level artifact data. Unfortunately, this cannot be determined for 3 of these (41DT42, 41DT44, and 41DT75) without reanalyzing the field notes and artifacts, and a fourth (41DT59) appears to have had such a complex occupational history that isolating components using data from the scattered test pits would be very difficult. Hence, only 4 tested sites—41DT21, 41DT52, 41DT63, and 41DT154—were added to the 8 mitigated sites for artifact comparisons.

The collections from 8 of the 12 sites used in the assemblage analysis (41DT6, 41DT11, 41DT16, 41DT62, 41DT63, 41DT154, 41HP159, and 41HP175) resulted from work dating to 1990 or later, and thus these materials were already at Prewitt and Associates. This was partly true for 41DT21 as well, although additional artifacts collected during excavations by the Dallas Archeological Society in 1962–1963 and housed at the Texas Archeological Research Laboratory were obtained on loan for reanalysis. The collections from the other three sites (41DT52, 41DT80, and 41DT124) resulted from work by Southern Methodist University in 1976 and 1987, and these materials were obtained on loan from that institution for restudy.

The reanalysis was aimed at ensuring consistency between the sites in terms of lithic tool and debris categories, projectile point types and raw material identifications, and ceramic categories. The more recently analyzed collections needed little additional work to achieve this consistency, but the older collections required complete recoding. Because of this, the artifact counts presented here may or may not agree with those provided in the original reports. The methods used in the reanalysis are the same as those employed in dealing with the materials from 41DT6, 41DT11, 41DT16, 41DT62, and 41HP175, and the reader interested in category definitions and the like is referred to those publications (Fields et al. 1993, 1994).

To the extent possible, artifact counts in the older collections were checked against those contained in reports (for 41DT80 and 41DT124) or original inventories (for 41DT21 and 41DT52) to try to make sure that artifacts were not missing. This resulted in a reasonable degree of comfort that the collections obtained on loan were intact, especially for 41DT21. Some doubts arose about this for 41DT52, 41DT80, and 41DT124 during the analysis, however, and the few potential problem areas identified are discussed briefly below.

Among the chipped stone artifacts, the primary suspected problems stemmed from tags saying "bifaces pulled" in the boxes of materials from 41DT52 and suspiciously low counts of unifaces in the 41DT80 and 41DT124 collections compared to the counts in the report. To try to determine if bifaces were indeed missing for 41DT52, the aggregate percentages of bifaces (preforms, gouges, other bifacial tools, and nontool bifaces) identified among the shaped chipped stone tools were calculated for the two components at this site and compared to the biface percentages for the other analyzed collections. The fact that the resulting figures for 41DT52 (61 percent for the early Caddoan component and 56 percent for the Woodland component) are not anomalously low compared to the mean of 57 ± 5 percent for the other 14 components suggests that there is no systematic problem with the 41DT52 collection, but this claim cannot be made with certainty (although it is supported by the fact that Southern Methodist University curation personnel could not locate any "pulled bifaces" separated from the 41DT52 collection).

It is difficult to evaluate the low frequencies of unifaces at 41DT80 and 41DT124 (0.5 and 1.0 percent of the shaped chipped stone tools) using percentages, since this tool class is infrequent in many of the other components as well (mean percentage = 2.5 ± 2.8). But some or all of the

TABLE 3

SUMMARY OF DATA FROM TESTED PREHISTORIC SITES WITH CONTROLLED EXCAVATIONS

Site	Diagnostic Artifacts*	Useful Radiocarbon Dates**	Thickness of Cultural Deposit	Evaluation of Components
41DT21***	232 ceramics 43 arrow points 13 dart points	1	40–90 cm	predominantly early Caddoan based on diagnostic artifacts, vertical distributions, and radiocarbon date
41DT36	none	no	–	unknown, as no materials were recovered from test pits; apparently surficial or eroded
41DT42	198 ceramics 7 arrow points 16 dart points	1	30–60 cm	Caddoan and perhaps earlier components are present, but lack of distributional and descriptive data prevents better evaluation
41DT44	10 dart points	no	up to 40 cm	probably pre-Caddoan, but lack of distributional and descriptive data prevents better evaluation
41DT50	11 ceramics 1 arrow point 7 dart points	1	30–70 cm	mixed Archaic, Caddoan, and probably Woodland components
41DT52***	215 ceramics 27 arrow points 27 dart points	2	75–95 cm	isolable Woodland and early Caddoan components based on diagnostic artifacts, vertical distributions, and radiocarbon dates
41DT54	96 ceramics 6 arrow points 5 dart points	no	20–50 cm	mixed Archaic, Caddoan, and probably Woodland components
41DT59	22 ceramics 9 arrow points 38 dart points	1	10–90 cm	Archaic, Woodland, and Caddoan components are present and may be isolable based on vertical and/or horizontal distributions, but this cannot be done with the testing data at hand
41DT63	86 ceramics 17 arrow points 6 dart points	3	70 cm	predominantly early Caddoan based on diagnostic artifacts, vertical distributions, and radiocarbon dates
41DT67	33 ceramics 5 arrow points	no	47–60 cm	could contain a single Caddoan component, but the data are too sparse for a better evaluation

*Includes only materials from controlled excavations, except at 41DT75, 41HP77, 41HP80, 41HP87, 41HP88, and 41HP103 where artifacts from excavations and surface collections are not reported separately.

**Excludes dates on soil humates and obviously recent dates.

***Includes only proveniences where components can be isolated most confidently; for 41DT21, this consists of the 1960s excavations and the 1991 excavations on the southern rise; for 41DT52, this consists of 1976 Excavation Units 15, 26, and 30.

Table 3, continued

Site	Diagnostic Artifacts	Useful Radiocarbon Dates**	Thickness of Cultural Deposit	Evaluation of Components
41DT75	2 ceramics 6 arrow points 8 dart points	no	up to 40 cm	Caddoan and perhaps earlier components are present, but lack of distributional and descriptive data prevents better evaluation
41DT84	6 ceramics 1 arrow point 1 dart point	no	20 cm	Caddoan and perhaps earlier components are present, but lack of distributional and descriptive data and sparseness of diagnostic artifacts prevent better evaluation
41DT127	2 ceramics 9 dart points	no	25–40 cm	mixed Archaic and Caddoan components
41DT141	1 arrow point	1	buried at 120–160 cm	stratified Caddoan and perhaps earlier components probably are present, but the data are too sparse for a better evaluation
41DT154	4 arrow points 23 dart points	no	80–100 cm	predominantly Woodland based on diagnostic artifacts and vertical distributions
41DT247	1 dart point	no	10–20 cm	data are too sparse for evaluation
41HP18	2 ceramics 1 dart point	no	up to 10 cm	Caddoan and perhaps earlier components are present, but lack of distributional and descriptive data and sparseness of diagnostic artifacts prevent better evaluation
41HP77	59 ceramics 2 arrow points 6 dart points	no	up to 35 cm	Caddoan and perhaps earlier components are present, but lack of distributional and descriptive data and sparseness of diagnostic artifacts prevent better evaluation
41HP80	3 dart points	no	up to 35 cm	could be pre-Caddoan, but lack of distributional and descriptive data and sparseness of diagnostic artifacts prevent better evaluation
41HP81	1 arrow point	no	5–20 cm	probably Caddoan, but lack of distributional and descriptive data and sparseness of diagnostic artifacts prevent better evaluation
41HP87	3 dart points	no	15–30 cm	could be pre-Caddoan, but lack of distributional and descriptive data and sparseness of diagnostic artifacts prevent better evaluation

Table 3, continued

Site	Diagnostic Artifacts	Useful Radiocarbon Dates**	Thickness of Cultural Deposit	Evaluation of Components
41HP88	3 arrow points 5 dart points	no	10–35 cm	Caddoan and perhaps earlier components are present, but lack of distributional and descriptive data and sparseness of diagnostic artifacts prevent better evaluation
41HP103	2 dart points	no	10–25 cm	could be pre-Caddoan, but lack of distributional and descriptive data and sparseness of diagnostic artifacts prevent better evaluation
41HP116	1 ceramic 1 arrow point 3 dart points	no	40–90 cm thick, buried beneath 25–50 cm of overburden	probably has stratified Woodland and Caddoan components, but the data are too sparse for a better evaluation
41HP118	none	1	at least 30 cm thick, buried beneath ca. 55 cm of alluvium	has stratified component(s) of uncertain age(s), but data are too sparse for a better evaluation
41HP136	28 ceramics 4 dart points	no	25–30 cm	Caddoan and perhaps earlier components are present, but the deposits are too thin and diagnostic artifacts are too sparse for a better evaluation
41HP138	3 arrow points 6 dart points	no	10–20 cm	Caddoan and perhaps earlier components are present, but the deposits are too thin and diagnostic artifacts are too sparse for a better evaluation
41HP155	none	1	80 cm thick, buried beneath 60–100 cm of overburden	probably has stratifed Caddoan components, but the data are too sparse to be certain

apparent discrepancies between the counts in the reanalysis and those reported by Southern Methodist University may be due to reclassification of some tools as modified flakes rather than unifaces, since the modified flake counts identified in the reanalysis are higher for both sites than they are in the Southern Methodist University report. Further, the reanalyzed collections for both sites contain greater numbers of shaped chipped stone tools than are indicated in the report, and this argues against the conclusion that parts of the collections are missing. As for 41DT52, this also is supported by the fact that Southern Methodist University curation personnel were unable to locate any unifaces separated from the 41DT80 and 41DT124 collections.

For the ceramics, it is clear that the collections obtained on loan are intact, or essentially so. The reanalyzed collections for all four sites are comparable in size to the reported or inventoried collections. The discrepancies noted can be attributed mostly to differences in how sherds too small for analysis were defined. Minor discrepancies also may have been introduced by counting recently broken sherds more than once during the original analyses but as

single occurrences in the reanalysis.

CULTURAL CHRONOLOGY

Judging from the 142 radiocarbon assays on charred materials from archeological contexts, it would appear that the cultural chronology of Cooper Lake dates almost solely to the last 2,000 years (Figure 24). While this certainly is the time when the area was occupied most intensively, Figure 24 probably exaggerates the scarceness of earlier occupations. This is due to the poor preservation of intact early components and the difficulty of finding the ones that are intact, given their occurrence in thick alluvial deposits.

Pre-Woodland Period

While a few clearly early artifacts have been found at Cooper Lake—for example, a Dalton point from 41DT16, a Plainview point from 41HP106, and a Hoxie point from the bed of Finley Branch near 41HP155 (Bousman et al. 1988:76; Fields et al. 1993:110; Perttula 1990a:173)—and larger numbers of early points (e.g., Clovis, Dalton, Meserve, Plainview, San Patrice, and Scottsbluff) have been reported from elsewhere in or near the upper Sulphur basin (Bohlin 1993; Preston 1972), too little early material has been recovered to allow much to be said about the Paleoindian and early Archaic chronology of Cooper Lake. The earliest dated archeological remains are the lower deposits at 41HP159. Based on four calibrated dates (two from Analysis Unit 3/4 and two from features just above these units; see Appendix B), these lower deposits span the period from ca. 4500 to 3000 B.C., or what traditionally would be considered the latter part of the middle Archaic and the early part of the late Archaic. Unfortunately, only one typeable dart point—a Yantis—was recovered (Figure 25), so it is difficult to identify artifacts that are diagnostic of this period.

The only three radiocarbon assays dating to the late Archaic period are from sites where components of this age may be present but have not been isolated from later components (41DT59 and 41HP106; see Appendix B). The single isolable component, the upper deposits at 41HP159 (Analysis Unit 1/2), can be assigned to part of this interval (1650–150 B.C.), based on the dates from the underlying deposits, a series of dates on buried soils, and the lack of ceramics and arrow points. The small dart point collection is quite diverse (Table 4; Figure 26), containing types that are uncommon in later contexts (Yarbrough, Dawson, Morrill, Trinity, Wesley, and Yantis) as well as ones that do occur later with some frequency (Gary and Kent). Perhaps most important is the fact that Yarbrough is the best-represented type, unlike the situation in any of the later components, indicating that this type is

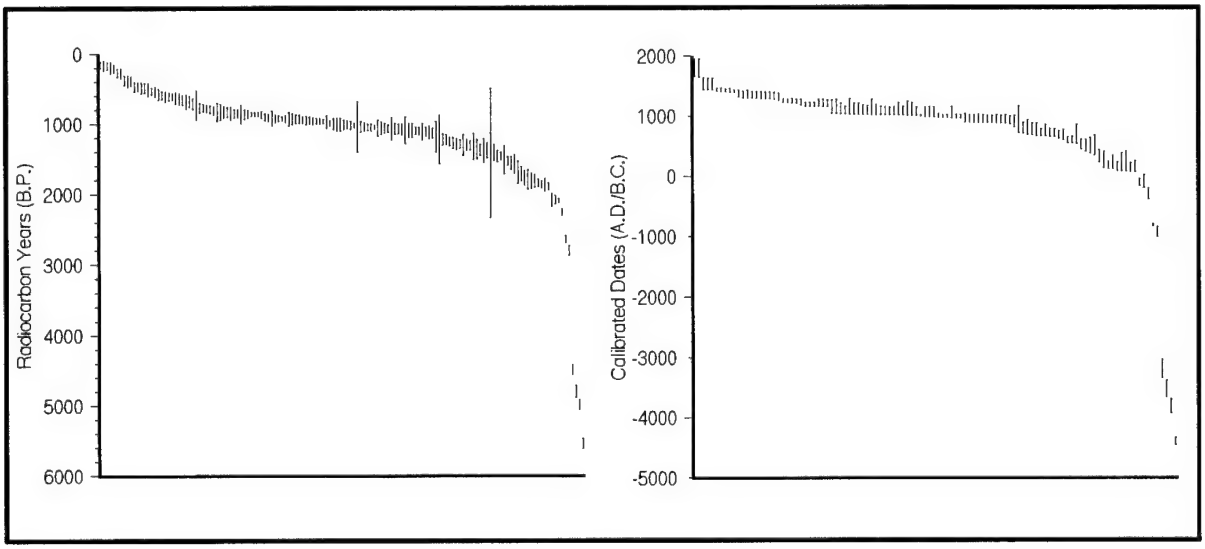


Figure 24. Graphs of radiocarbon assays on charred materials from cultural contexts at Cooper Lake; graph on the left shows 1-sigma age ranges for all assays, some corrected for fractionation and some not; graph on the right shows calibrated (Stuiver and Reimer 1993) 1-sigma date ranges for the 109 corrected assays.

Figure 25. Yantis dart point from the late middle Archaic component at 41HP159.

relatively diagnostic of the late Archaic period at Cooper Lake.

Woodland Period

Thirty-two radiocarbon assays fall predominantly in the interval commonly ascribed to the Woodland period, i.e., from the first or second century B.C. to about A.D. 800 (see Appendix B), and these represent the early stages of a period of intensive use of the project area by Native Americans. Ten of these dates are from excavated components dating predominantly to this interval (at 41DT6, 41DT16, 41DT52, and 41DT62), 14 are from probably mixed contexts at these same sites or from other sites where Woodland deposits cannot be isolated consistently from later deposits (at 41DT11, 41DT21, 41HP78, 41HP102, and 41HP137), and 6 dates are from contexts at 41HP106 where two potentially isolable Woodland components are present but have not yet been separated from later components. One of the final two dates is from an apparently isolable but little-sampled Woodland component at 41DT124, while the other is from a context of ambiguous age at 41DT141.

Based on the evidence from 41DT6, 41DT16, 41DT52, and 41DT62, along with that from the undated but presumably contemporaneous Woodland component at 41DT154, it appears that there are no artifacts that are truly diagnostic of the period. Gary points dominate all of the dart point collections, ranging from 55 percent of the typed specimens at 41DT62 to 81 percent of those at 41DT154 (Figure 27). Kent points occur in moderate frequencies (13–28 percent) at three sites (41DT52, 41DT62, and 41DT154) and in smaller numbers (7–8 percent) at 41DT6 and 41DT16, suggesting that this was a consistent but minor type in the Woodland period. Dawson points make up 16 percent of the typed specimens in Analysis Unit 3/4 at 41DT6 and could represent an even more minor Woodland type, but they are infrequent at 41DT16 and 41DT62 and missing entirely at 41DT52 and 41DT154; hence, the Dawson points may indicate the addition of some late Archaic materials into these predominantly Woodland components. Certainly, the presence of earlier materials (or maybe recycling of earlier points) explains most of the other infrequent types shown for these components in Table 4.

All five of the Woodland components have very low ratios of arrow points to dart points (0.2:1 or less), and it is clear that the few arrow points in these contexts represent later materials that have been mixed in by bioturbation. A similar conclusion can be reached for the small numbers of ceramics. Pottery is missing entirely at 41DT62 and 41DT154, and the low ratios of sherds to shaped chipped stone tools at the other three sites (0.10:1 to 0.31:1) argue that ceramic technology was not introduced until the succeeding early Caddoan period (Table 5). Further, there is nothing in terms of sherd thickness, temper types, or decorative attributes that distinguishes the small sherd collections from these Woodland contexts from the later collections (see Table 5).

Early Caddoan Period

The flattest part of the radiocarbon date graphs in Figure 24, and hence the period with the greatest number of dates (n = 74; see Appendix B), spans the interval from ca. A.D. 800 to 1300. This time, i.e., the first half of the Caddoan period, was when the Cooper Lake area was used most intensively by Native Americans. Most of these assays (n = 48) are from 41DT6, 41DT11, 41DT16, 41DT21, 41DT52, 41DT63, 41DT80, and 41DT124 where early Caddoan components were isolated successfully, and most of the remainder (n = 20) are from 41DT42, 41HP78, 41HP102, 41HP105, and 41HP106 where the abundant early Caddoan materials cannot be (or have not yet been) fully separated from earlier or later remains. Four assays are from sites with minor components dating to this period (at 41DT62 and 41HP155), while the final two are anomalous in that they are from a site that dates chiefly to the late Caddoan period (41HP175).

The evidence from 41DT6, 41DT11, 41DT16, 41DT21, 41DT52, 41DT63, 41DT80, and 41DT124 indicates that the early Caddoan period saw two major technological innovations that resulted in a constellation of relatively diagnostic artifacts. One of these was the introduction of the bow and arrow, and in all of the components listed above arrow points outnumber dart points. There is considerable

TABLE 4

RELATIVE FREQUENCIES OF TYPED PROJECTILE POINTS AND ARROW/DART POINT RATIOS

	Dart Points	Arrow Points	Arrow/Dart Point Ratio*
MIDDLE ARCHAIC			
41HP159	Yantis (100%); n = 1	—	0
LATE ARCHAIC			
41HP159	Yarbrough (25%), Dawson (13%), Gary (13%), Kent (13%), Morrill (13%), Trinity (13%), Wesley (6%), Yantis (6%); n = 16	—	0
WOODLAND			
41DT6	Gary (72%), Dawson (16%), Kent (7%), Bell/Calf Creek (2%), Yarbrough (2%); n = 43	Bassett (33%), Colbert (33%), Steiner (33%); n = 3	0.1
41DT16	Gary (78%), Kent (8%), Dawson (5%), Morrill (3%), Yarbrough (3%), Bell/Calf Creek (1%), Dalton (1%), Williams (1%); n = 79	Colbert (40%), Catahoula (20%), Rockwall (20%), Scallorn (20%); n = 5	0.1
41DT52	Gary (57%), Kent (21%), Edgewood (7%), Morrill (7%), Yantis (7%); n = 14	Talco (100%); n = 1	0.1
41DT62	Gary (55%), Kent (28%), Yarbrough (8%), Dawson (2%), Ellis (2%), Ensor (2%), Wesley (2%); n = 40	—	<0.1
41DT154	Gary (81%), Kent (13%), Yarbrough (6%); n = 16	Alba (100%); n = 2	0.2
EARLY CADDOAN			
41DT6	Gary (81%), Dawson (11%), Kent (6%), Yarbrough (3%); n = 36	Colbert (35%), Scallorn (21%), Catahoula (15%), Steiner (9%), Fresno (6%), Friley (6%), Washita (6%), Alba (3%); n = 34	1.2
41DT11	Gary/Kent (38%), Gary (35%), Kent (14%), Bell/Calf Creek (5%), Carrollton (3%), Wells (3%), Yarbrough (3%); n = 37	Colbert (44%), Steiner (18%), Friley (11%), Catahoula (8%), Keota (6%), Bonham (5%), Scallorn (4%), Turney (4%), Huffaker (1%); n = 166	4.8
41DT16	Gary (77%), Dawson (7%), Kent (7%), Bell/Calf Creek (3%), Marshall (1%), Morrill (1%), Wells (1%), Yarbrough (1%); n = 71	Colbert (34%), Steiner (24%), Catahoula (12%), Minter (8%), Friley (5%), Scallorn (4%), Alba (3%), Cliffton (2%), Homan (2%), Fresno (2%), Perdiz (2%), Turney (1%), Washita (1%); n = 122	2.1

*Ratio calculated using typed points and classifiable but untyped points; excludes untypeable fragments.

Table 4, continued

	Dart Points	Arrow Points	Arrow/Dart Point Ratio*
41DT21	Gary (75%), Kent (17%), Edgewood (8%); n = 12	Steiner (35%), Colbert (29%), Catahoula (18%), Alba (12%), Homan (6%); n = 17	2.3
41DT52	Gary (83%), Kent (17%); n = 6	Colbert (44%), Catahoula (25%), Steiner (13%), Alba (6%), Haskell (6%), Perdiz (6%); n = 16	2.8
41DT63	Gary (67%), Yarbrough (33%); n = 3	Catahoula (27%), Rockwall (18%), Bassett (9%), Cliffton (9%), Colbert (9%), Friley (9%), Perdiz (9%), Steiner (9%); n = 11	3.7
41DT80	Gary (89%), Yarbrough (11%); n = 19	Colbert (33%), Steiner (33%), Cliffton (6%), Alba (5%), Bonham (5%), Catahoula (5%), Minter (3%), Scallorn (3%), Cuney (1%), Fresno (1%), Friley (1%), Homan (1%), Turney (1%); n = 78	5.2
41DT124	Gary (91%), Ellis (9%); n = 11	Steiner (50%), Colbert (29%), Catahoula (6%), Bonham (3%), Cliffton (3%), Homan (3%), Alba (2%), Keota (2%), Hayes (1%); n = 94	10.2
LATE CADDOAN			
41HP175	Gary (100%); n = 2	Turney (37%), Perdiz (34%), Cliffton (9%), Fresno (9%), Talco (4%), Bassett (2%), Catahoula (1%), Homan (1%), Rockwall (1%), Steiner (1%); n = 90	50.5

variation in the arrow/dart point ratios, however, with 41DT6 having a low value of 1.2:1, four sites (41DT16, 41DT21, 41DT52, and 41DT63) having moderately low values of 2.1:1 to 3.7:1, two sites (41DT11 and 41DT80) having moderately high values of 4.8:1 and 5.2:1, and 41DT124 having a very high ratio of 10.2:1. Because the early Caddoan components at these sites are not stratigraphically distinct and because not all are well dated, it remains unclear if this variation reflects true chronological differences within the period between the components, varying admixtures of earlier materials, or perhaps even some functional differences between the sites. While Schambach's (1982b:173) argument that dart points did not continue to be used into the early Caddoan period in southwestern Arkansas suggests that their presence in early Caddoan contexts at Cooper Lake may be a function of mixing, there are several reasons that the contrary interpretation—that the atlatl and dart were used along with the bow and arrow during at least the early part of the period—is favored here. First, dart points occur consistently in contexts at Cooper Lake that date to A.D. 800–1300 based on radiocarbon assays, and some of these contexts are in depositional settings where some degree of stratification is evident. Second, Gary points were found at 41HP175 in alluvial fan deposits that may entirely postdate the Woodland period, judging from the radiocarbon dates on nutshells indicating a primary occupation in the A.D. 1400s and, more importantly, an assay on soil humates from the buried A horizon containing the site which has a calibrated 2-sigma date range of A.D. 1020–1280. Third, much of the

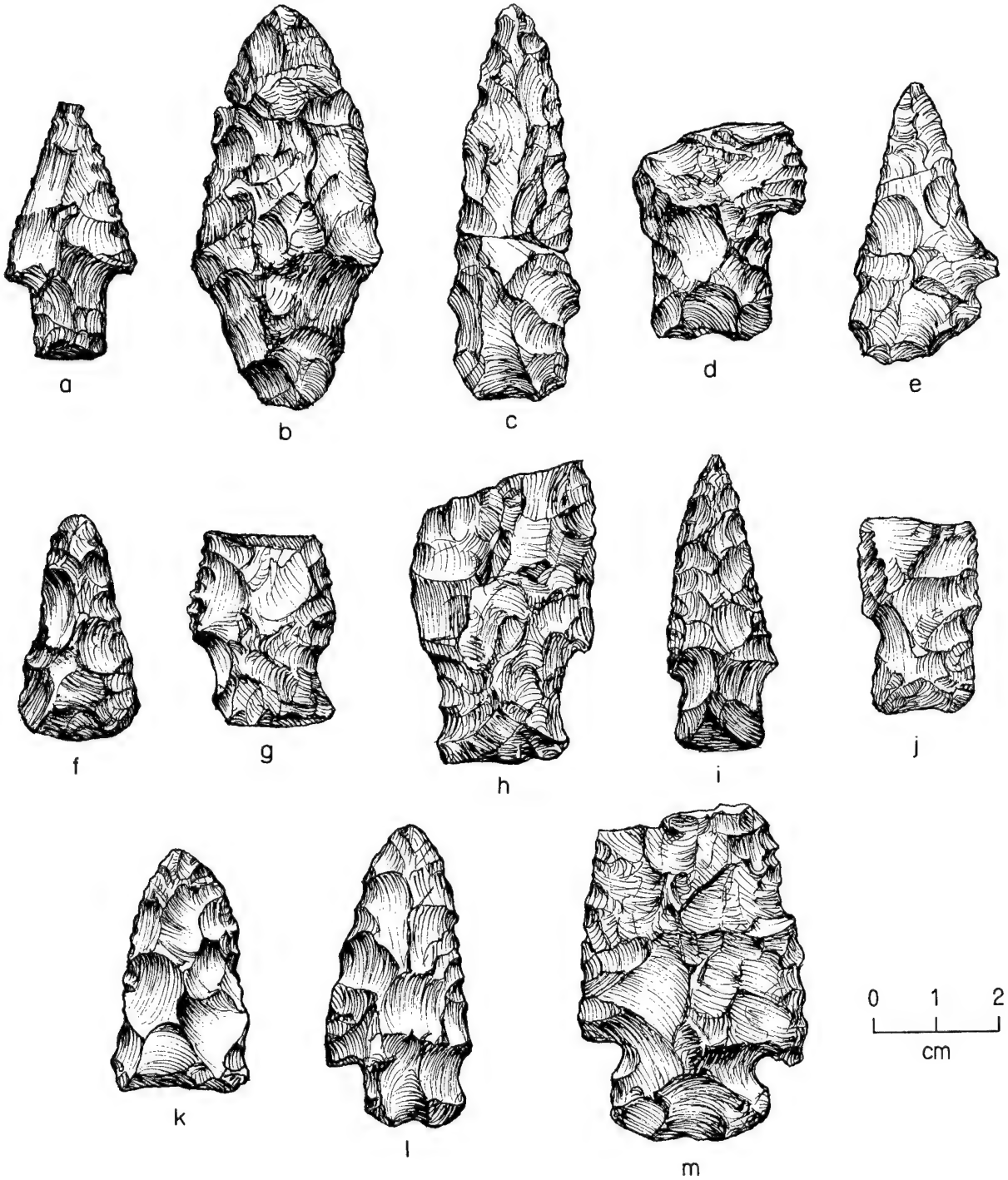


Figure 26. Dart points from the late Archaic component at 41HP159. (*a*) Dawson; (*b*) Gary; (*c*) Kent; (*d*) Morrill; (*e*) Trinity; (*f*) Wesley; (*g–j*) Yarbrough; (*k*) untyped stemless; (*l–m*) untyped expanding stem.

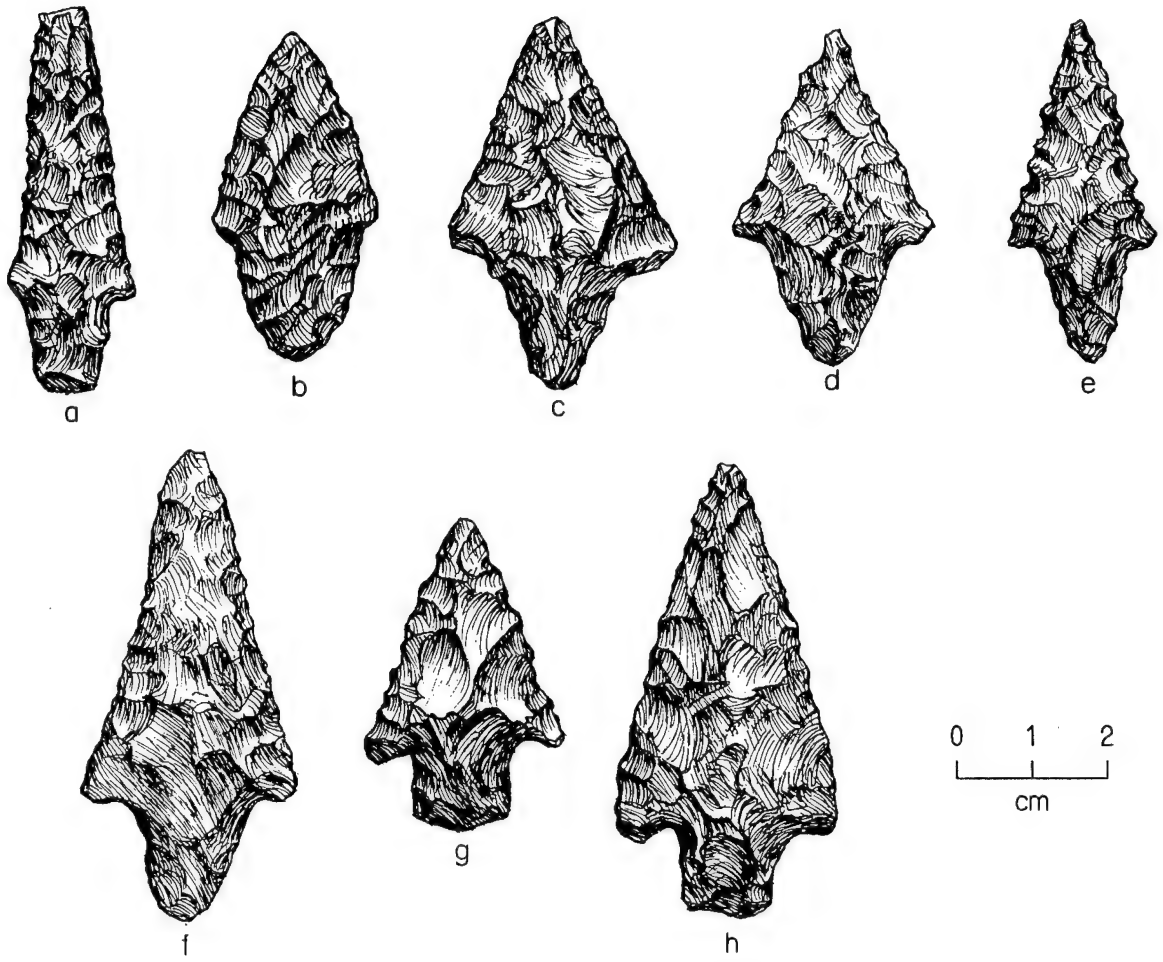


Figure 27. Dart points from Woodland contexts. (*a*) Dawson; (*b–f*) Gary; (*g–h*) Kent.

data used by Schambach (1970, 1982b) is not from well-stratified depositional contexts, making it difficult to know how much faith to put into his lists of diagnostic artifacts (which, of course, is not to say that he is incorrect). And fourth, Cooper Lake clearly is marginal to the heart of the Caddoan area and saw cultural developments that proceeded at a conservative pace compared to the Great Bend region of the Red River valley, and there is no reason to assume that the abandonment of the atlatl and dart occurred at the same time in the two areas.

The early Caddoan components exhibit substantial consistency in terms of arrow point styles (Figure 28). Colbert points are the most common of the typed specimens at five of the sites, ranging from 33 percent at 41DT80 to 44 percent at both 41DT11 and 41DT52. Where this type does not predominate, it ranks second (29 percent at 41DT21 and 41DT124), except in the small sample from 41DT63 where it constitutes only 9 percent. Steiner is the second most common style, ranking first at 41DT21 and 41DT124 (35 and 50 percent, respectively), second at three sites (41DT11, 41DT16, and 41DT80; 18–33 percent), and third at 41DT52 (13 percent); it occurs consistently but in smaller numbers (9 percent) at 41DT6 and 41DT63. The third primary type is Catahoula. It is the most common type at 41DT63 (27 percent), it ranks second at 41DT52 (25 percent), and it ranks third at three other sites (41DT6, 41DT16, and 41DT21; 12–18 percent); this type occurs in smaller percentages (5–8 percent) at the the remaining three sites.

Arrow point types that achieve more occasional prominence but that can still be considered diagnostic of the early Caddoan period in the upper Sulphur basin include Alba, Friley, and Scallorn. Twelve percent of the typeable specimens in the small collection from 41DT21 are classed as Alba, while

TABLE 5

SUMMARY OF CERAMIC ATTRIBUTES

	Sherd/Shaped Tool Ratio*	Sherd Thickness (cm)	Temper Type**	% Decorated	Decorative Technique***	% Red Slipping	Types
WOODLAND							
41DT6 (n = 43)	0.25	0.79 ± 0.15	grog, 60% bone, 37% shell, 2%	12	engraved, 60% incised, 20% punctated, 20%	0	—
41DT16 (n = 35)	0.10	0.82 ± 0.14	grog, 60% bone, 37% none, 3%	11	incised, 25% punctated, 75%	0	McKinney/Nash/Emory
41DT52 (n = 22)	0.31	****	grog, 82% bone, 18%	9	incised, 100%	0	Crockett Curvilinear Incised? Williams Plain?
EARLY CADDOAN							
41DT6 (n = 301)	1.02	0.79 ± 0.18	grog, 52% bone, 45% shell, 2% none, 1%	11	engraved, 29% incised, 35% punctated, 26% appliquéd, 6% other, 3%	2.0	Crockett Curvilinear Incised Maydelle/Canton Incised McKinney/Nash/Emory
41DT11 (n = 849)	0.83	0.76 ± 0.19	grog, 63% bone, 28% shell, 3% quartzite, 5% none, 2%	17	engraved, 38% incised, 46% punctated, 14% other, 1%	1.4	Crockett Curvilinear Incised Crockett/Pennington Spiro Engraved? Williams Plain
41DT16 (n = 544)	0.83	0.78 ± 0.17	grog, 58% bone, 38% shell, 1% none, 3%	16	engraved, 36% incised, 19% punctated, 36% brushed, 7% other, 1%	2.6	Crockett Curvilinear Incised Pennington Punctated Incised Maydelle/Canton Incised McKinney/Nash/Emory
41DT21 (n = 232)	1.45	0.75 ± 0.17****	grog, 77% bone, 22% shell, <1% none, 1%	14	engraved, 12% incised, 36% punctated, 45% brushed, 6%	1.7	Crockett Curvilinear Incised Crockett/Pennington Williams Plain

Table 5, continued

	Sherd/Shaped Tool Ratio	Sherd Thickness (cm)	Temper Type	% Decorated	Decorative Technique	% Red Slipping	Types
41DT52 (n = 193)	2.30	****	grog, 80% bone, 16% shell, 2% none, 3%	12	engraved, 22% incised, 65% punctated, 4% brushed, 4% other, 4%	1.0	Crockett Curvilinear Incised? Williams Plain?
41DT63 (n = 86)	2.00	0.82 ± 0.23	grog, 62% bone, 38%	6	punctated, 100%	1.2	Williams Plain
41DT80 (n = 300)	0.79	****	grog, 77% bone, 21% shell, 1% none, 1%	18	engraved, 5% incised, 24% punctated, 55% appliquéd, 4% brushed, 4% other, 9%	0.7	Crockett Curvilinear Incised Crockett/Pennington Duren/LaRue Neck Banded Williams Plain
41DT124 (n = 506)	1.33	****	grog, 77% bone, 22% shell, 1% none, 1%	7	engraved, 26% incised, 40% punctated, 34%	0.2	Crockett Curvilinear Incised Crockett/Pennington Kiam/Dunkin Incised? Coles Creek Incised Williams Plain
LATE CADDOAN							
41HP175 (n = 1,947)	5.66	0.66 ± 0.17	grog, 57% bone, 2% shell, 41% none, <1%	21	engraved, 41% incised, 3% punctated, 29% appliquéd, 9% brushed, 16% other, 2%	5.4	Ripley Engraved Avery Engraved Taylor/Wilder Engraved Simms Engraved Nash Neck Banded McKinney Plain Emory Punctated

*The sherd/shaped tool ratio is provided to give an indication of the importance of the use of ceramic vessels relative to activities involving the use of formal chipped stone tools; other lithic categories are excluded to avoid biases resulting from small sample sizes or variable sample sizes due to recognition difficulties and technological changes.

**Grog refers to grog alone; bone includes bone alone, bone with grog, and white flecks that are probably bone; shell includes shell alone and shell with grog.

***Engraved and incised refers to engraving and incising alone; punctated includes all kinds of punctations (i.e., stick, fingernail, and reed), with or without incising or engraving; appliquéd includes sherds with appliqué strips or nodes, with or without punctations.

****Sherd thickness not measured for 41DT52, 41DT80, and 41DT124; the measured sample from 41DT21 consists of the 35 sherds from the 1991 testing.

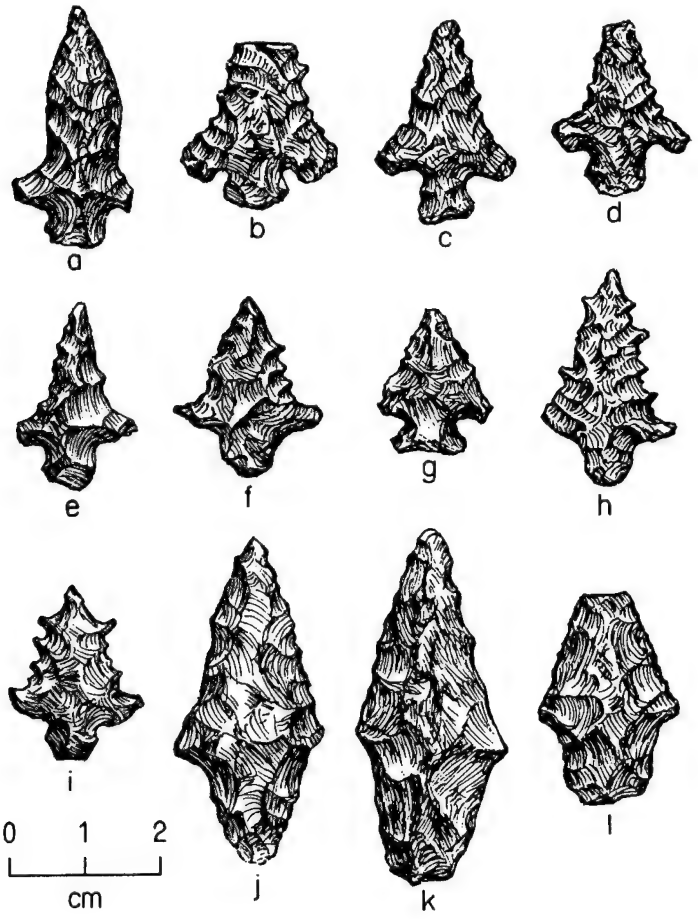


Figure 28. Arrow and dart points from early Caddoan contexts. (*a*) Alba; (*b*) Catahoula; (*c–e*) Colbert; (*f*) Friley; (*g*) Scallorn; (*h–i*) Steiner; (*j–k*) Gary; (*l*) Kent.

this type occurs infrequently at 41DT6, 41DT16, 41DT52, 41DT80, and 41DT124 (2–6 percent), and it is absent at 41DT11 and 41DT63. Friley is the third most common type at 41DT11 (11 percent), and it constitutes 9 percent of the typed points at 41DT63, 5–6 percent of those at 41DT6 and 41DT16, and 1 percent of those at 41DT80; Friley points are not present in the collections from 41DT21, 41DT52, and 41DT124. The Scallorn type is notably common only at 41DT6 (21 percent), but it occurs in smaller numbers (3–4 percent) at 41DT11, 41DT16, and 41DT80; this type is missing from the 41DT21, 41DT52, 41DT63, and 41DT124 collections.

A number of other types occur in small numbers in the assemblages. The presence of some of these (e.g., Bonham, Haskell, Hayes, Homan, and Keota) probably can be traced to interaction with early to middle Caddoan groups who lived outside the upper Sulphur River valley, while other types (e.g., Bassett, Fresno, Huffaker, Perdiz, Turney, and Washita) clearly represent the addition of later materials. These late points, including Perdiz and Turney which occur in high frequencies in the late Caddoan component at 41HP175 (see below), are few in number in the early Caddoan components, indicating nonintensive use of these sites during the late Caddoan period.

The consistent occurrence of the three major early Caddoan arrow point types—Colbert, Steiner, and Catahoula—and the three minor types—Alba, Friley, and Scallorn—implies a strong degree of cultural continuity within the upper Sulphur River basin during the period between A.D. 800 and 1300. The length of this interval may partly explain why there are multiple prominent point styles, but the data are not sufficiently fine grained (i.e., the components are not stratigraphically distinct, and not all are well dated) to allow chronological differences in the use of these types in the Cooper Lake area to be identified.

A single type, Gary, dominates all the collections of dart points from the early Caddoan components, ranging from 75 percent of the typed specimens at 41DT21 to 91 percent of those at 41DT124, excluding the very small collection from 41DT63 (67 percent Gary) and the 41DT11 collection where 73 percent are typed as Gary or Gary/Kent. Kent points occur in small to moderate frequencies (6–17 percent) at five sites (41DT6, 41DT11, 41DT16, 41DT21, and 41DT52), and thus this minor Woodland type may have continued to be used into the early Caddoan period, although its absence at 41DT63, 41DT80, and 41DT124 suggests that this may not have been the case. The remainder of the low-frequency types in these collections (e.g., Bell/Calf Creek, Carrollton, Dawson, Edgewood, Ellis, Marshall, Morrill, Wells, and Yarbrough) all reflect earlier minor components at these sites or recycled earlier artifacts.

Ceramics occur consistently in the early Caddoan components, but they are not always frequent. For example, the ratios in Table 5 show that they are less numerous than shaped chipped

stone tools at three sites (41DT11, 41DT16, and 41DT80) and only slightly more common at three others (41DT6, 41DT21, and 41DT124). Sherds are notably frequent only at 41DT52 and 41DT63. It is difficult to account for this variation with the existing data. It may reflect chronological or functional differences between the sites, or it may be due to differences in how the sites were sampled or the degree of sherd fragmentation. Regardless, all of the collections are generally similar in character and clearly represent a single predominant ceramic tradition (see Table 5; Figure 29).

Grog is the most common temper type in all cases, ranging from 52 percent at 41DT6 to 80 percent at 41DT52. Without exception, most of the remaining sherds contain bone temper. Together, these two temper types constitute between 91 and 100 percent of the sherds from the eight sites. Shell-tempered sherds are few and represent minor additions of later materials. Where measured, the mean sherd thickness values consistently hover around 0.80 cm. Decorated ceramics make up 6–18 percent of the collections, with the predominant decorative techniques being engraving, incising, and punctating. Brushing, appliqué, and red slipping are generally rare, and most of these sherds probably are intrusive later materials. While the sites exhibit a fair amount of variability in terms of the relative percentages of the three main decorative techniques, the types represented by these sherds are quite consistent from site to site. By far, most of the more distinctive decorated sherds can be related to the common early Caddoan type Crockett Curvilinear Incised or to a hybrid between Crockett and Pennington Punctated-Incised (see Figure 29). Present in small numbers are sherds with decorative treatments (e.g., overhanging incised lines or incised lips) that are more common on ceramics from the Lower Mississippi Valley, and some of these are classified as Coles Creek Incised. Also present in consistently small numbers are base-body sherds from flowerpot-shaped vessels that are strongly reminiscent of Williams Plain. Occurring occasionally are sherds that could be classified as Maydelle or Canton Incised based on diagonal-line decorations on rims, as Kiam or Dunkin Incised based on body punctations, or as Duren or LaRue Neck Banded based on the careless crimping and lack of shell temper. The most aberrant ceramics are a small number of body sherds from 41DT11 that are tempered with angular quartzite and that display decorations similar to motifs found on Spiro Engraved. Finally, a few sherds are typeable as McKinney Plain, Nash Neck Banded, or Emory Punctated; these, along with the few largely undecorated red-slipped sherds, are intrusive from later components.

Middle Caddoan Period

Ten radiocarbon assays date mostly to the A.D. 1300s, or the middle part of the Caddoan period (see Appendix B). They are discussed separately here because, while no artifact assemblages assignable to this interval have been isolated definitively, this appears to have been a time when Native Americans began to use the Cooper Lake area less intensively than before. Five of these dates are from the South Rise at 41HP106, and this is the best candidate for a site with an isolable middle Caddoan component. The extent to which it can be separated (and characterization of an artifact assemblage possible) will be determined in the near future as the final report on this site is completed. Of the five remaining assays, three are from 41DT52 and 41HP102 where materials dating to this time may be present but cannot be separated from earlier remains, one is from 41HP175 which mostly postdates this interval, and one is from 41DT50 and may reflect contamination by nonarcheological charcoal.

Late Caddoan Period

Twelve radiocarbon assays fall mostly in the A.D. 1400s, or the late part of the Caddoan period (see Appendix B). Nine are from 41HP175, the sole excavated site dating to this period. Of the other three, two are from 41DT11 and 41HP102 and may relate to late occupations that cannot be identified amongst the overwhelmingly abundant earlier materials. The final assay, from 41HP159, probably represents contamination by younger, nonarcheological charcoal.

The late Caddoan materials from 41HP175 are distinctive in a number of ways. Arrow points vastly outnumber dart points (see Table 4), making it clear that the bow and arrow had entirely (or nearly so) replaced the atlatl and dart by this time. The arrow points are dominated equally by two types—Turney and Perdiz—while most of the types represented by few specimens (i.e., Bassett, Cliffton, Fresno, and Talco) are minor late styles (Figure 30).

Figure 29. Vessel forms and most common decorations from early Caddoan contexts.

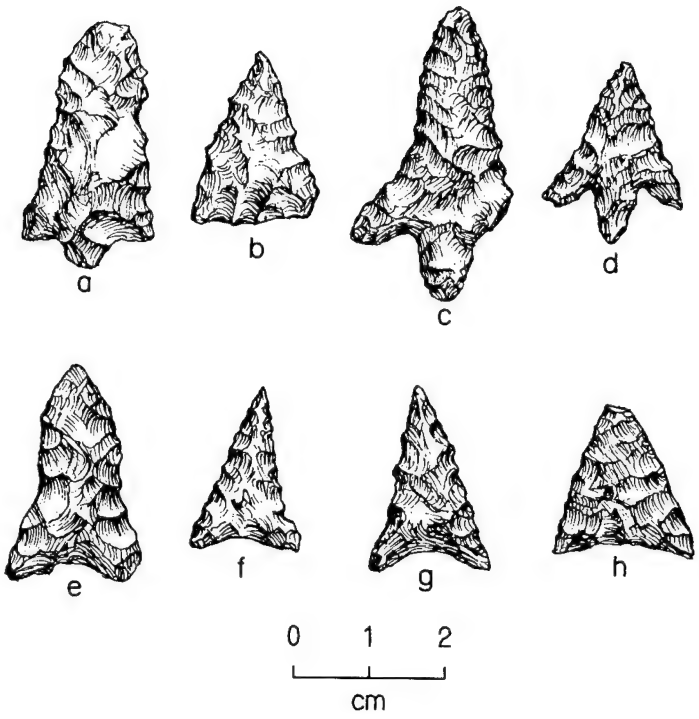


Figure 30. Arrow points from late Caddoan site 41HP175. (*a*) Cliffton; (*b*) Fresno; (*c–d*) Perdiz; (*e*) Talco; (*f–h*) Turney.

Several earlier types (Catahoula, Homan, Rockwall, and Steiner) occur in very small numbers and apparently represent a sparse earlier component or artifact recycling, and this may be the case for the two Gary points as well.

The ceramic collection is distinctive first because sherds are so numerous. For example, they substantially outnumber shaped chipped stone tools (see Table 5), indicating that pottery was a much more prominent part of the material culture than it had been during the early Caddoan period. Further, a wider range of vessel forms is represented, hinting at greater functional diversity (Figure 31).

While grog continued to be the primary temper type during the late Caddoan period, bone as a tempering agent was very nearly supplanted by shell (see Table 5). Additional changes in ceramic technology may be reflected by the much smaller mean sherd thickness value for 41HP175 (0.66 cm) than for the earlier sites. Other differences can be seen in the more common use of decoration (on 21 percent of the sherds), the more frequent use of red slipping (5.4 percent), and the more common occurrence of the techniques of brushing and appliqué (together making up 25 percent of the decorated sherds). On a typological level, the collection, containing sherds assignable to or reminiscent of Ripley Engraved, Avery Engraved, Simms Engraved, Taylor/Wilder Engraved, McKinney Plain, Nash Neck Banded, and Emory Punctated, shows no overlap at all with the collections from early Caddoan contexts (except for the McKinney/Nash/Emory sherds that are intrusive into the earlier deposits).

Post-Late Caddoan Period

The final seven radiocarbon assays postdate A.D. 1500 (see Appendix B), but it is doubtful that these accurately reflect the true ages of the accompanying archeological materials. Rather, it is likely that they represent postoccupational burning or mixing of older archeological charcoal and modern charcoal. Five of these are from sites where early Caddoan and/or Woodland materials predominate (41DT16, 41DT21, 41DT37, and 41DT52), while one (210 ± 60 B.P.) is on charcoal from trench backdirt at late Caddoan site 41HP175. The final assay (165 ± 70 B.P.) is from 41HP103, which appears to be Woodland or early Caddoan in age based on the two Gary points recovered.

While an important historic trace running from the Red River in Louisiana to the Taovayas-Wichita villages on the upper Red River probably crossed the Sulphur River only about 50 km downstream from Cooper Lake (Perttula 1990a:33–34), there is very little evidence that Native Americans used the project area during the very late prehistoric and early historic periods. In fact, the most reliable indication of early historic Indian use consists of just three artifacts, single glass trade beads from 41DT111 and 41HP77 and a reworked gunflint at 41HP80. Less reliable are some anomalous Native American ceramics from a context dating to the second quarter of the nineteenth century at 41DT126 (Green 1995:506–513). None of these sites has an isolable historic Indian component, however, and it appears that the Cooper Lake area was effectively abandoned by Native Americans after A.D. 1500.

PALEOENVIRONMENTAL RECONSTRUCTION

Aside from faunal and botanical remains from

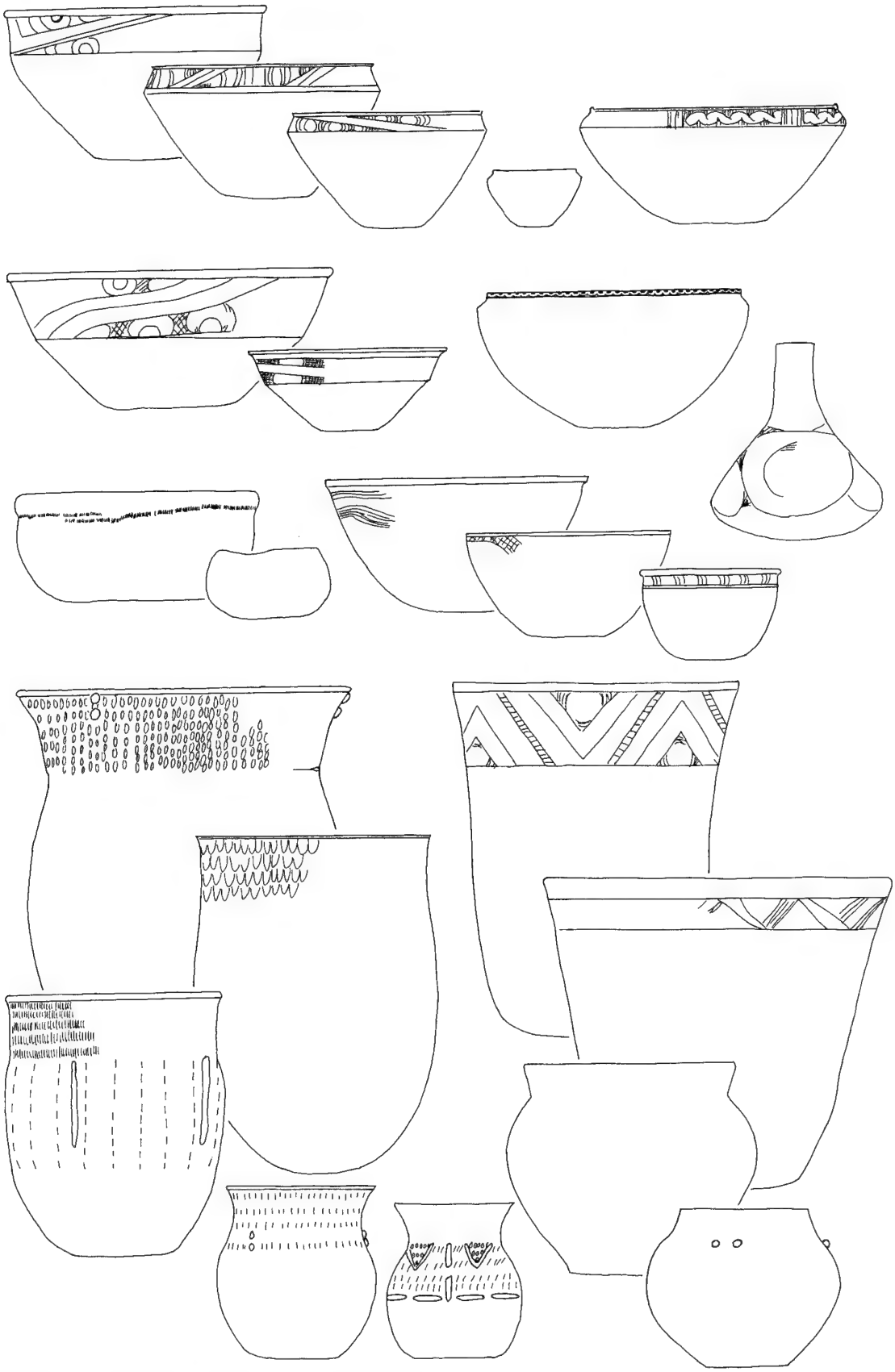


Figure 31. Late Caddoan vessel forms and decorations.

cultural contexts, the archeological investigations at Cooper Lake have not yielded the kind of evidence needed to contribute to a reconstruction of late Quaternary and Holocene paleoenvironments. This can be attributed largely to the poor preservation of such indicators as pollen and phytoliths. In addition, the geomorphic evidence is of little help because of the complexity of the geological record and the inability to discern consistent patterns of deposition, soil formation, and erosion that can be related with confidence to environmental changes (see Chapter 1).

This is evidenced by the geomorphic data from the alluvial fan along Finley Branch, which is one of the more intensively studied locales at Cooper Lake. Three sites on this fan have been examined: 41HP155 on the proximal portion of the fan (Gadus et al. 1991); 41HP159 on the medial portion (Gadus, Fields, Bousman, and Howard 1992); and 41HP175 on the distal portion (Fields et al. 1993). At 41HP155, most of the deposits represent cut-and-fill episodes, and thus the deposits (except for the modern soil) cannot be related to those at the other two sites. At 41HP159, six buried soils were documented dating from 1995 B.P. to 10,820 B.P. (ages corrected but not calibrated; see Appendix B), while just three buried soils dating from 890 B.P. to 9710 B.P. were observed at 41HP175 (Figure 32). Correlations of buried soils between these locations can be proposed in only two cases, at ca. 3500 B.P. and ca. 9500 B.P., and it is clear that the depositional histories of these two parts of the fan are different. Further complicating the picture are the $\delta^{13}C$ values for the correlatable soils, which are markedly lower at 41HP175 than 41HP159 (see Figure 32). As 41HP159 and 41HP175 are only a few hundred meters apart, this suggests that these values may be controlled to a large extent by local conditions which may or may not reflect regional paleoenvironmental changes. Unfortunately, $\delta^{13}C$ corrections were not made for most of the radiocarbon assays on soil humates from the project area, so it is impossible to determine if there are general patterns in the fluctuation of $\delta^{13}C$ values (and thus perhaps the relative frequencies of C_3 and C_4 plants) through time. Cliff, Green, Hunt, Shanabrook, and Peter (1996:12) present additional recently obtained dates and isotope values from the Sulphur River drainage downstream from Cooper Lake (the archeological relevant ones are 3030 ± 100 B.P. [–21.9], 3480 ± 80 B.P. [–24.4], 4310 ± 90 B.P. [–23.1], 6370 ± 100 B.P. [–18.8], and 6540 ± 90 B.P. [–19.9], but

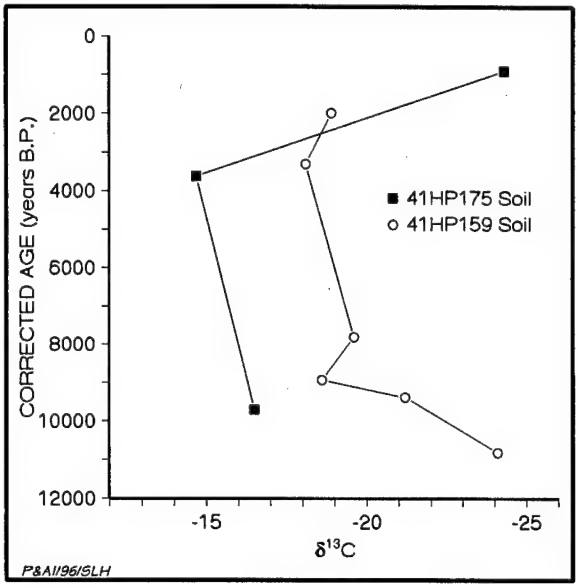


Figure 32. Plot of corrected radiocarbon ages and $\delta^{13}C$ values for buried soils at 41HP159 and 41HP175.

these are not sufficiently numerous to help in discerning patterns in the $\delta^{13}C$ data for the Sulphur basin as a whole.

An additional problem with the data concerns the accuracy of the humate dates themselves. Of the 31 humate assays from the project area (see Appendix B), only 18 are from A horizons where the dates arguably might provide a reasonable approximation of when soils formed on stable (or slowly aggrading) surfaces. The other 13 dates are from B or C horizons or channel fills, and their reliability is especially questionable given their contexts. Further, the limited evidence from 41HP155 suggests that there may be a problem with old carbon in some settings (Gadus et al. 1991:43). Specifically, two of the assays from 41HP155, one on humates and the other on noncultural charcoal, were from a single context, a deeply buried alluvial clay and gravel lens (labeled a 2C2 horizon and not altered significantly by formation of the overlying soils) just above a 3Ab horizon, and these yielded significantly different corrected ages of 2835 ± 65 B.P. (charcoal) and 4250 ± 80 B.P. (humates). Because the humate date is much older than the charcoal date rather than younger, as might be expected with the addition of organics from the overlying soils, it appears that old carbon was redeposited along with the sediments forming the clay and gravel lens. The extent to which old carbon has affected the A horizon humate dates from Cooper Lake is unknown, but the paired

sample from 41HP155 certainly suggests that the dates should be viewed with caution.

While the humate dates on A horizons may be more reliable (since there is a greater likelihood that the humates were derived from plants that grew on the A horizon surfaces), the evidence supporting even this conclusion is equivocal. For example, the corrected age for the assay on humates from the 2A horizon containing 41HP175 (890 ± 60 B.P.) and the mean age of 500 B.P. for the 10 assays on charcoal from cultural contexts at the site are reasonably close given that the humate date reflects soil formation over a long span of time, much of which preceded formation of the archeological deposits (Fields et al. 1993:176; see Appendix B). In contrast, a humate assay from a 2Ab horizon at 41DT141 yielded an uncorrected age of 1100 ± 70 B.P., while a burned tree stump from channel fill stratigraphically below the 2Ab horizon yielded an uncorrected age of 320 ± 80 B.P. (Gadus et al. 1991:25). Deposition of the tree stump clearly predated formation of the overlying soil, and this implies that the 2Ab horizon contained substantial older carbon. The uncertainty about the reliability of the humate dates, along with their small number and the fact that most are from only a few locales, makes them of little use in identifying temporal patterns in soil formation that might then be related to paleoenvironments.

The faunal and macrobotanical remains recovered from archeological sites at Cooper Lake provide some clues about paleoenvironments, although they are limited in that they are culturally biased and they relate only to the last 2,000 years, i.e., to the period after the establishment of essentially modern conditions (Bousman 1991:21–28). The faunal remains consistently indicate the use of animals from woodland, woodland-edge, and aquatic habitats (especially white-tailed deer, turtles, cottontail, and mussels), as would be expected in the bottomlands along the Sulphur River (see Subsistence below). Grasslands taxa such as bison and pronghorn are present in small numbers at some sites and apparently reflect exploitation of upland prairies adjacent to the river valley, but there are no large-scale differences in faunal assemblages indicating dramatic changes in the extent of grasslands at the expense of woodlands during the Woodland and Caddoan periods. This conclusion is supported further by the macrobotanical remains from components dating to these time periods, since the collections contain materials representing a variety of trees (e.g., hickory, pecan, oak, black walnut, hackberry, honey locust, and water locust) and other plants (e.g., grape, wild plum, and *Rubus*) that would have been most common in or adjacent to the river valley.

SETTLEMENT PATTERNS

This topic is explored under the three headings of Intrasite Structure, Ranges of Activities, and Use Intensity. While certainly not mutually exclusive, they form a useful framework for examining patterns of settlement within the Cooper Lake area. The most important questions dealt with here concern how permanently and how frequently sites were occupied, as well as what kinds of activities were performed.

Intrasite Structure

While most of the excavated sites do not have discrete occupational episodes and most have not seen broad excavations aimed at studying site structure, several have yielded sufficient artifact or feature distributional data to allow some inferences about this topic. These can be discussed best by time period.

Archaic Period

For the Archaic period, the only evidence concerning intrasite structure comes from the distributions of the artifacts relative to the rock hearths found in Analysis Units 1–4 at 41HP159. In all four cases, high artifact densities occur within 2 m of the hearths, with the overall concentrations of materials generally measuring 6 m or less in diameter (Figure 33). The excavations were not sufficiently extensive to determine how many such activity loci were present at any one time, but the consistently small size of these concentrations implies that they represent short-term use by small groups. Further, the fact that these activity loci are discernible at all suggests that the site was not reoccupied many times, since frequent reuse would have led to more homogeneous, less distinct distributions.

Woodland Period

There are no fully isolated and dated Woodland

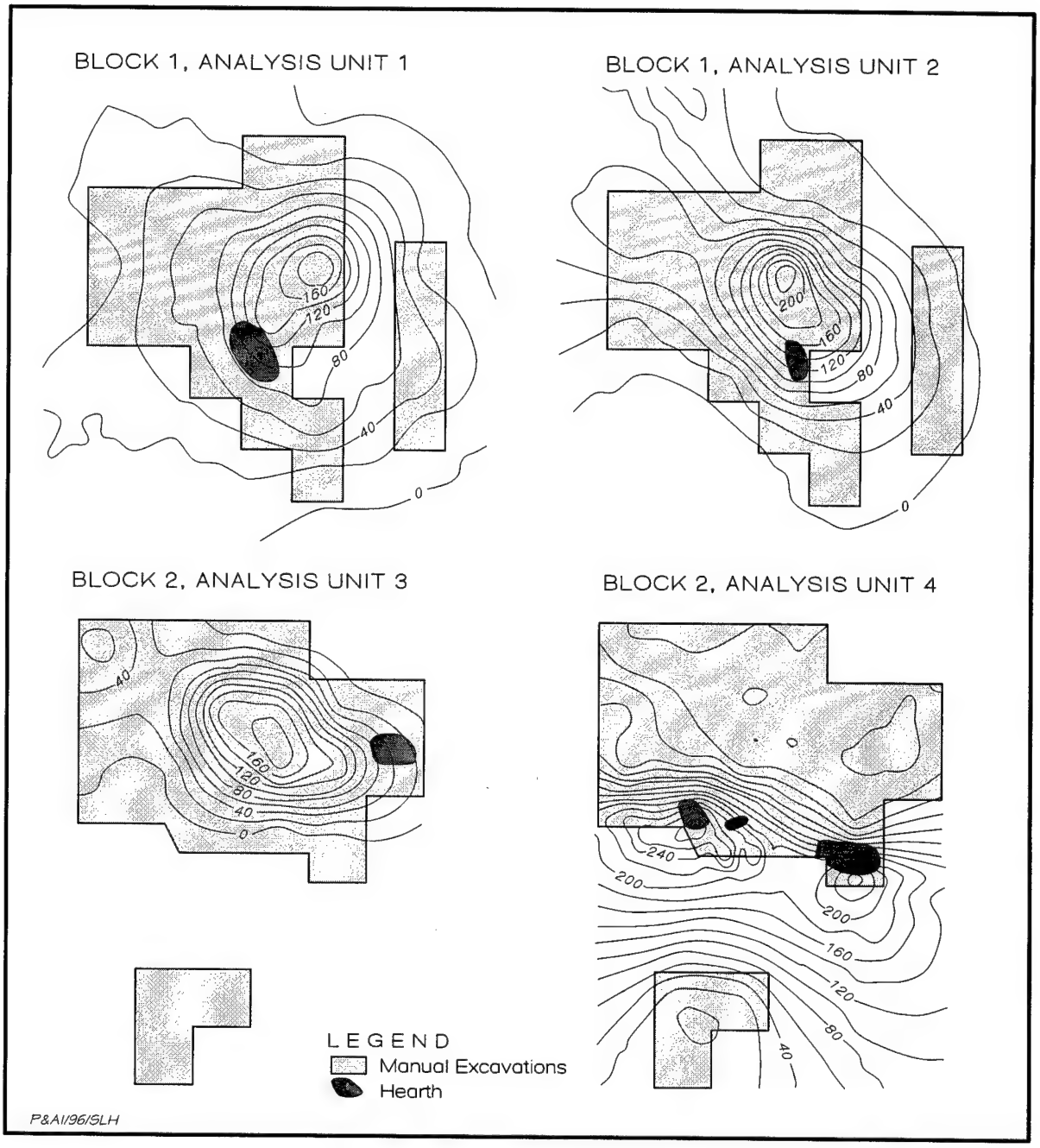


Figure 33. Isopleth maps of artifact frequencies at 41HP159.

components with sufficient data on intrasite structure. Some Woodland components, such as those at 41DT6 and 41DT16, contain middens and occasional features, but the excavations were not large enough to allow the identification of distributional patterning in these multicomponent sites. Other Woodland components, such as those at 41DT62 and 41DT154, lack middens and apparently lack features as well, but the limited excavations done at these sites also are not conducive to examining distributional patterning.

Perhaps the best candidate for a Woodland component with this kind of data is the Southwest Rise at 41HP106, although the radiocarbon and artifactual evidence indicates that this part of Hurricane Hill contains multiple components dating to the

late Archaic and Caddoan periods as well (see Appendixes B and C). Nonetheless, the data suggest that many of the features there may be of Woodland age (see Perttula 1995). While the manual excavations were too limited to look at artifact distributions, mechanical scraping did uncover a number of burials, pits, postholes, and a hearth (Figure 34). The burials are the most important of these, since most are clustered in an area of ca. 11 x 4 m and there are no cases where burials intrude upon one another. These characteristics imply that the site was occupied with sufficient intensity to allow the establishment of a cemetery. This could indicate long-term individual occupations, frequent reoccupation, or both. The presence of a midden on the Southwest Rise (a Woodland period midden is also present on the North Rise ca. 75 m away and Woodland materials also were found in Area B of 41HP106 downslope to the west of the Southwest Rise [T. K. Perttula, personal communication 1995]) and pits and postholes near the cemetery, perhaps representing associated loci of domestic activities, could support either scenario.

Early Caddoan Period

The best data concerning intrasite structure come from the early Caddoan period. While all of the excavated early Caddoan components have middens indicating intensive occupation and most (e.g., 41DT16, 41DT80, and 41DT124) have numerous features, the most useful information on this topic comes from just two sites (41DT11 and 41HP106), only one of which (41DT11) has a fully isolable component that can be assigned to this period. The data from 41HP106 are more tenuous because of problems with multicomponency, although the radiocarbon dating done during this synthesis

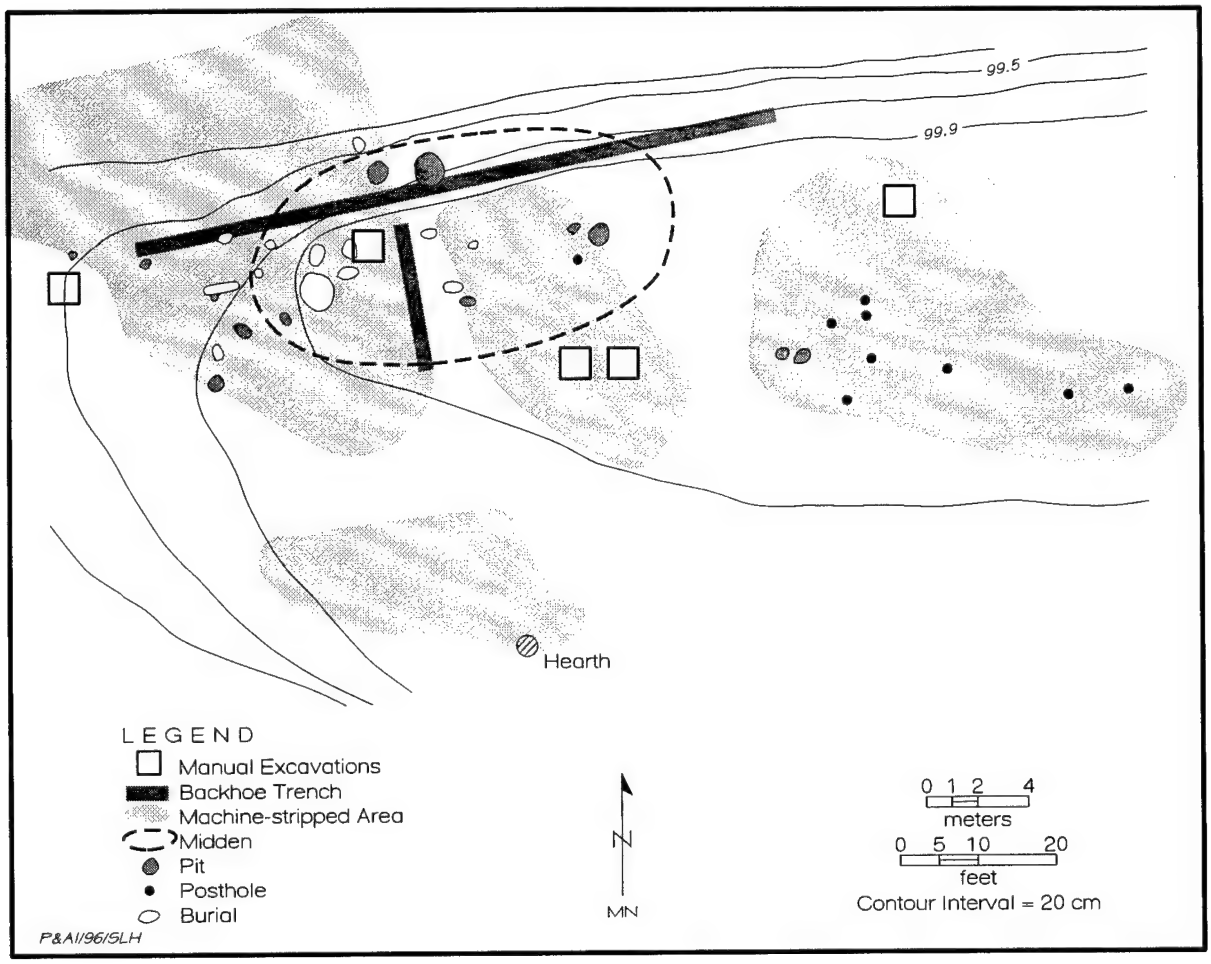


Figure 34. Plan of the Southwest Rise at 41HP106 showing features (after Perttula 1990a).

provides a starting point for separating at least the features into components.

41DT11, SPIDER KNOLL

The manual excavations, extensive machine stripping, and trenching at 41DT11 resulted in the identification of a spatially discrete midden and the recording of numerous postholes and pits (of varying sizes), as well as a few hearths. The distributions of the features and the extent of the midden deposits allowed three subareas to be defined (Figure 35). The postholes and the large pits tend to be located in different parts of the site, and while organically enriched, middenlike sediments were found over a large area, the thickest and richest midden deposits were confined to an area just south of the part of the site containing features. These subareas provide the framework for interpreting the structure of 41DT11.

The western subarea contains 28 of the 33 postholes and possible postholes, 7 of the 12 small pits, all 5 medium-sized pits, 2 hearths, and the single log mold; it covers approximately 360 m². The postholes do not form patterns that can be interpreted unquestionably as representing houses. Yet, many of the postholes can be grouped into arcs suggestive of structural walls. The two longest arcs, both encompassing semicircular areas, account for 13 of the postholes, and it is hypothesized that these represent two houses. The fact that these arcs do not form full circles could mean that some postholes did not extend into the basal clay and hence went undetected during the excavations, or more likely that these proposed structures were unlike the kinds of houses documented at other sites in the Caddoan area, i.e., substantial fully enclosed circular or subrectangular houses.

The western semicircular arc consists of six postholes and may represent a structure with a maximum diameter of ca. 8 m. Adjacent postholes tend to be spaced far apart, with a range of 2.1 to 3.9 m ($\bar{x}$ = 2.8, σ = 0.7). The postholes are generally small, ranging from 10 to 23 cm in diameter ($\bar{x}$ = 15.3, σ = 4.2). Seven postholes make up the eastern semicircular arc, which may represent a structure with a maximum diameter of ca. 10 m. These postholes also are widely spaced, at 2.0 to 3.7 m apart ($\bar{x}$ = 2.7, σ = 0.7), and they range from 9 to 21 cm in diameter ($\bar{x}$ = 15.9, σ = 3.5).

Centrally located within the western arc, and perhaps associated with it, is a medium-sized pit; no other features are contained within this arc. A hearth and two small pits are situated in the center of the eastern arc, while a hearth and a small pit are located along its eastern side, a small pit sits near the northern edge, and a small pit lies just outside its unbounded southwestern side. The hearth central to the eastern arc may well be associated with this possible structure given the correspondence between the corrected radiocarbon assays from this hearth and one of the postholes in the arc (1065 ± 55 and 1095 ± 55 B.P., respectively). The hearth along the eastern edge probably is not associated given its radiocarbon assay of 850 ± 90 B.P., and it may represent use of this area for outside activities associated with occupation of the western structure.

Assuming that these two arcs do represent houses, it would appear that the parts of the western subarea to the south and north were used as outside activity areas. To the south are a small pit, an isolated posthole, and an L-shaped arrangement of three postholes, one of which is associated with the possible log mold. These latter four features could represent a structure such as a small arbor or drying rack. North of the possible house arcs are 11 postholes, 4 medium-sized pits, and 1 small pit. Some of these postholes occur in clusters, such as the three forming a small L-shaped pattern at the north edge of the area, and these probably represent structures such as drying racks or arbors. The five pits in this area are clustered just northeast of the proposed eastern house. Based on the corrected radiocarbon assays from two of these pits (1060 ± 80 and 1140 ± 90 B.P.) and those from two of the features associated with the eastern posthole arc (1065 ± 55 and 1095 ± 55 B.P.), it is hypothesized that these pits represent an outside processing area associated with the eastern house.

The eastern subarea contains all 6 of the large pits, 5 of the 33 postholes, 5 of the 12 small pits, and 1 hearth; it covers an area of ca. 280 m². The large pits are distributed north-south along the western side of the subarea, with both of those containing evidence of reuse as hearths (i.e., areas of oxidized sediments in pits dug into original pit fill) being in the central portion. Also along the western side is an isolated posthole near a single small pit. Situated along the eastern edge of the subarea are two isolated postholes and two isolated small pits, and the southern margin is demarcated by two isolated postholes. An isolated small pit and a

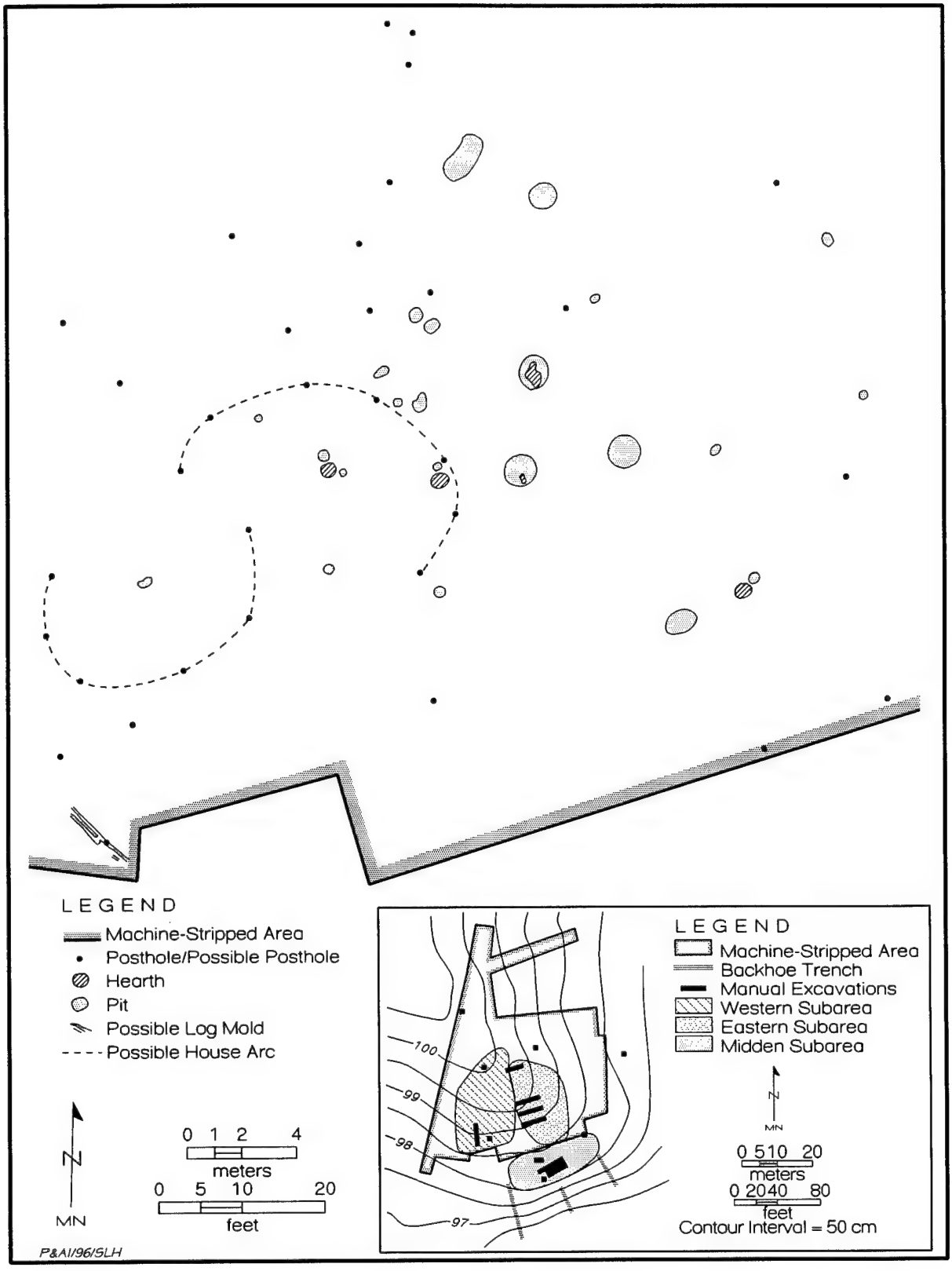


Figure 35. Plan of 41DT11 showing features and subareas.

hearth and adjacent small pit lie in the south-central part of the subarea east of two of the large pits. The features suggest that there were no structures in this part of the site, and the eastern subarea appears to have been used for a variety of outside activities. The corrected radiocarbon dates from six of the features (830 ± 70, 830 ± 80, 930 ± 50, 1010 ± 70, 1080 ± 80, and 1095 ± 55 B.P.) suggest that its use in this fashion was not limited to a particular part of the occupation span.

The third subarea refers to the part of the site that was used most consistently for refuse disposal, i.e., as a midden. As noted above, midden-stained sediments blanket much or all of the site, but the richest part of the midden is restricted to a relatively small area of ca. 250 m². This area is at the foot of the slope just south of the structure and outside activity loci defined as the western and eastern subareas.

In sum, the feature evidence suggests that 41DT11 contains three distinct loci of activities, and this consistent use of space implies occupations of long duration and reuse of the site over time in a patterned manner. Trash disposal occurred most consistently on the south edge of the site. To the north, domiciliary activities and outside activities associated with small and medium pits and probably structures such as drying racks and brush arbors were most common in the western half of the site, while outside activities associated with large pits were most common in the eastern half.

The incomplete posthole patterns, small posthole size, and wide spacing between the postholes indicate that, if the arcs in the western subarea do represent structures, these were not the sorts of substantial, permanently occupied houses typically found at Caddoan residential sites. Rather, they may have been more akin to large arbors or sun/wind screens that were used seasonally.

Interpreting these posthole patterns simplistically, it is possible to suggest that the site saw two sequential periods of use during which houses were built. In view of the nonpermanent nature of the structures, however, it seems improbable that only two occupations could account for the formation of the midden. Further, the radiocarbon dates suggest a ca. 400-year occupation span, and this would not be consistent with a simple scenario of two seasonal occupations. Finally, the consistency in the use of space that is indicated by the overall feature distributions (i.e., the functionally distinct subareas) implies a degree of continuity between sequential occupations that would be unlikely to result from a limited number of use episodes over a 400-year period. Hence, it appears that the number of posthole arcs potentially marking houses is not representative of the number of times the site was occupied. Based on this, it appears that 41DT11 was used in the same general fashion (i.e., for residential purposes) repeatedly, but that the use episodes varied in duration and perhaps seasonality such that the need for structures and other facilities varied from occupation to occupation.

41HP106, HURRICANE HILL

The extensive manual and mechanical excavations at the Hurricane Hill site exposed many features that apparently relate to intensive occupation during the early Caddoan period and extending into the middle part of the period. These remains were concentrated in two parts of the site termed the South Rise and the North Rise, which were some 25 m apart (see Figure 20). The artifacts associated with these occupations have not been isolated into components (this is scheduled to be done in the near future as part of the completion of the final report on the work at this site), but the features and radiocarbon dates provide considerable evidence about the use of space and the nature of the occupations.

The South Rise contained 98 postholes (or stains that are probably postholes), 23 pits of varying sizes, 2 hearths, 3 human burials, 1 dog burial, and 4 middens. Most of the postholes apparently represent two overlapping houses (called Structures A and B; Figure 36). Because the central hearths within the houses partly overlap and because several large interior postholes may mark main support post locations for both structures, it is surmised that the two houses were associated and used sequentially. Judging from the radiocarbon dates obtained during this synthesis, it appears that Structure B dates to the latter half of the A.D. 1200s, with Structure A dating to the first half or three-quarters of the A.D. 1300s (see Appendix C).

Perttula (1990a:125–133) was able to separate the features belonging to the two houses based on depth, differences in the fill, and the intersection of key postholes with the Structure A postholes originating ca. 10 cm higher than those assigned to Structure B. Neither set of postholes exhibits a

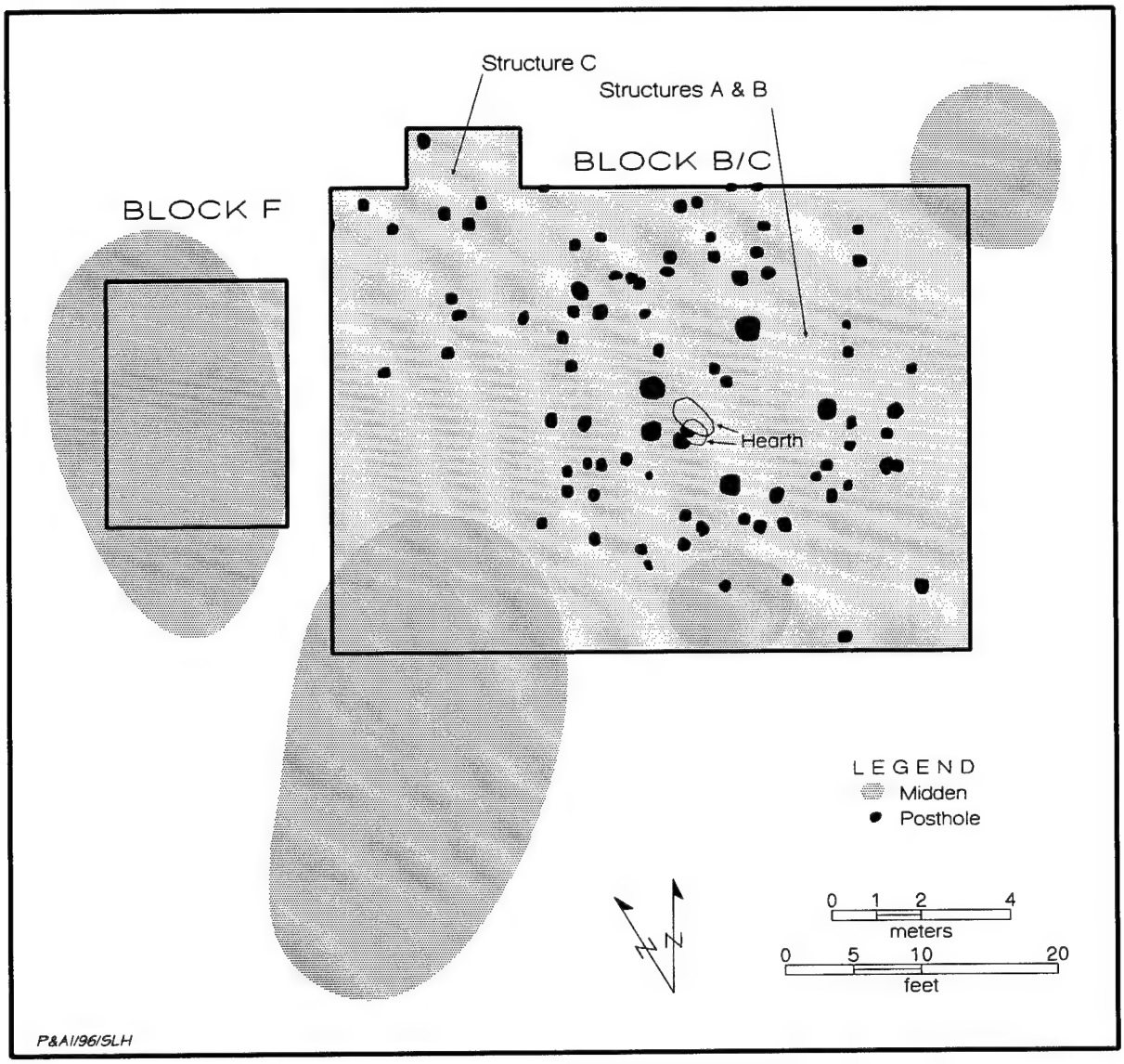


Figure 36. Plan of Blocks B/C and F on the South Rise at 41HP106 showing selected features (after Perttula 1990a).

well-defined pattern clearly indicating the house walls, but Perttula (1990a:125–133) suggested that Structure A measured ca. 6.0 x 7.5 m and had an entrance on the east side while Structure B may have been somewhat larger (ca. 7.1 x 7.6 m) and had an extended entryway on the south side. Both houses have central hearths and roughly square arrangements of relatively large (average diameter = 44.2 ± 5.4 cm) interior support posts. The postholes that probably represent exterior walls are smaller (average diameters = 22.8 ± 3.6 cm [Structure A] and 26.5 ± 5.3 cm [Structure B]), but they are still considerably larger than those at 41DT11 (15.3 ± 4.2 cm for the western posthole arc and 15.9 ± 3.5 cm for the eastern arc). This suggests that these structures were more substantial than those proposed for 41DT11.

The South Rise excavations identified three middens that were probably associated with Structures A and B. Two were small, covering areas of only 4–8 m^2, and were situated immediately outside the proposed house entryways. The third, larger (ca. 50 m^2) midden was southwest of the houses. Other features that probably were associated include the burials, pits of uncertain function both within the houses and outside of them, and three small clusters of postholes and large pits in scraped areas away from the structures that may represent outside

activity areas.

A third house (Structure C) may be marked by a concentration of postholes in the northwestern part of excavation Block B/C. Perttula (1990a:133) suggested that this partly exposed circular structure measured about 6 m in diameter and that it may have postdated the others. No radiocarbon dates were obtained from Structure C, however, and the temporal assessment is based on its proximity to a small midden (ca. 40 m^2) to the west in Block F that appeared to be late based on its stratigraphic position and the presence of shell-tempered pottery. In any case, these postholes are similar in size (average diameter = 25.2 ± 3.9 cm) to those assigned to Structures A and B, lending support to the idea that they represent a similar kind of structure.

The excavations on the North Rise exposed 33 postholes, 20 pits, 3 hearths, 5 human burials, and 3 middens. The largest of the middens (covering the entire rise), a few of the burials (i.e., the cremations), and perhaps a few of the pits apparently relate to use during the Woodland period based on stratigraphic and spatial relationships and artifact content, but the smaller middens (labeled Middens 1 and 2) and the remainder of the features resulted from Caddoan period occupations (Perttula 1990a: 73–82, 96–114). Perttula (1990a:108–114) suggested that most of the postholes represent two rectangular houses (Structures D and E), but they were not fully exposed and hence were not well defined (Figure 37). Nonetheless, the mean diameters of the postholes assigned to Structure D (21.9 ± 3.1 cm) and Structure E (24.7 ± 4.1 cm) differ little from those of Structures A–C, and the North Rise houses may have been similar to those on the South Rise in terms of size and construction.

Neither structure was dated, but three corrected radiocarbon assays of 900 ± 50, 1050 ± 50, and 1070 ± 80 B.P. from presumably associated features (one of the middens and a burial) suggest that these houses date to the early Caddoan period, probably predating those on the South Rise (see Appendix C). The smaller of the two Caddoan middens covered ca. 14 m^2 and was about 4 m south of Structure E, while the larger midden (ca. 90 m^2) overlay Structure E and was just west of Structure D. Given the position of the middens and the proximity of the two proposed structures to one another, it is presumed that the houses were not used contemporaneously. Rather, they are more likely to represent sequential use. Most of the pits, two of the hearths, and several isolated postholes were in the middens, and these probably represent outside activity areas.

Overall, the distributions of the features indicate that 41HP106 saw intensive and consistent use for residential purposes in the early and middle parts of the Caddoan period. Domiciliary activities apparently were concentrated first on the North Rise and subsequently shifted to the South Rise, with both areas containing multiple sequential occupations. Evidence of repeated use of midden areas near the structures was found on both rises, as were extramural activity areas. A few clusters of features that may mark more-distant outside activity areas, perhaps comparable to some of those identified at 41DT11, were found on the South Rise, and limited Caddoan remains apparently representing nondomiciliary use were found on the Southwest Rise. It is clear that 41HP106 supported occupations of long duration and was reused in a consistent manner over time.

Because the postholes at 41HP106 are larger than those at 41DT11 and more numerous, it is likely that the houses at Hurricane Hill were more substantial and were occupied on a more permanent basis, perhaps even year-round. This may have been especially the case during the latter part of the early Caddoan period and the middle Caddoan period, since postholes are especially frequent on the South Rise. Nonetheless, the postholes at 41HP106 do not form the kinds of house patterns consisting of regularly (and often closely) spaced postholes that are usually found at Caddoan farmstead and village sites (e.g., Bruseth and Perttula 1981:25, 42; Good 1982:54–60; Kelley 1994:57, 61, 70; Thomas et al. 1980:115, 128). Thus, even though the houses at 41HP106 may have been relatively substantial compared to those proposed for 41DT11, they still may not have been comparable to the houses built by groups who were fully integrated into the Caddoan culture.

Late Caddoan Period

A single late Caddoan site, 41HP175, has contributed information concerning intrasite structure. The manual and mechanical excavations into this single-component (or nearly so) site identifed two distinct concentrations of cultural materials adjacent to an abandoned channel of Finley Branch (Figure 38). The two concentrations were separated by a ca.

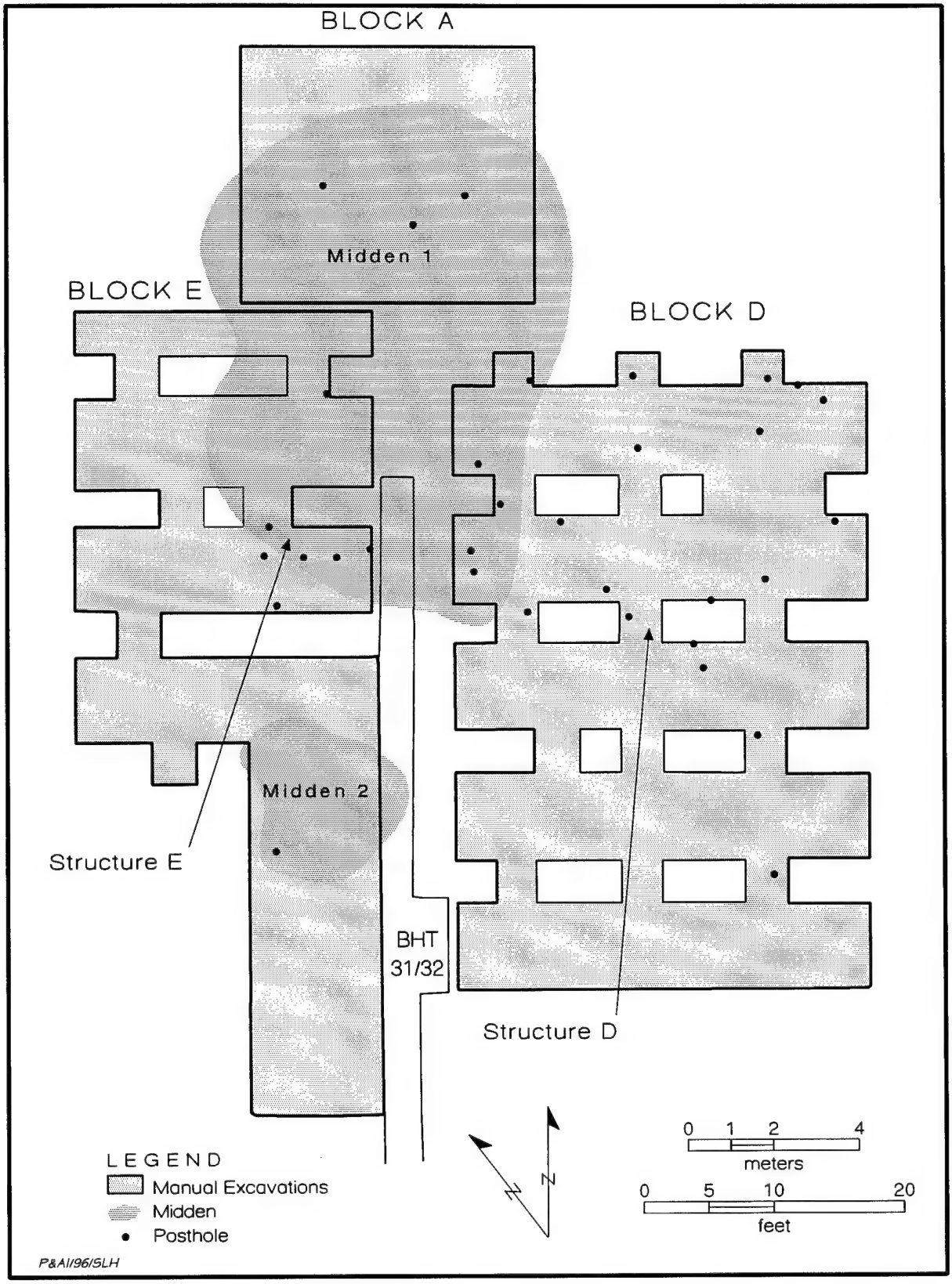


Figure 37. Plan of Blocks A, D, and E on the North Rise at 41HP106 showing selected features (after Perttula 1990a).

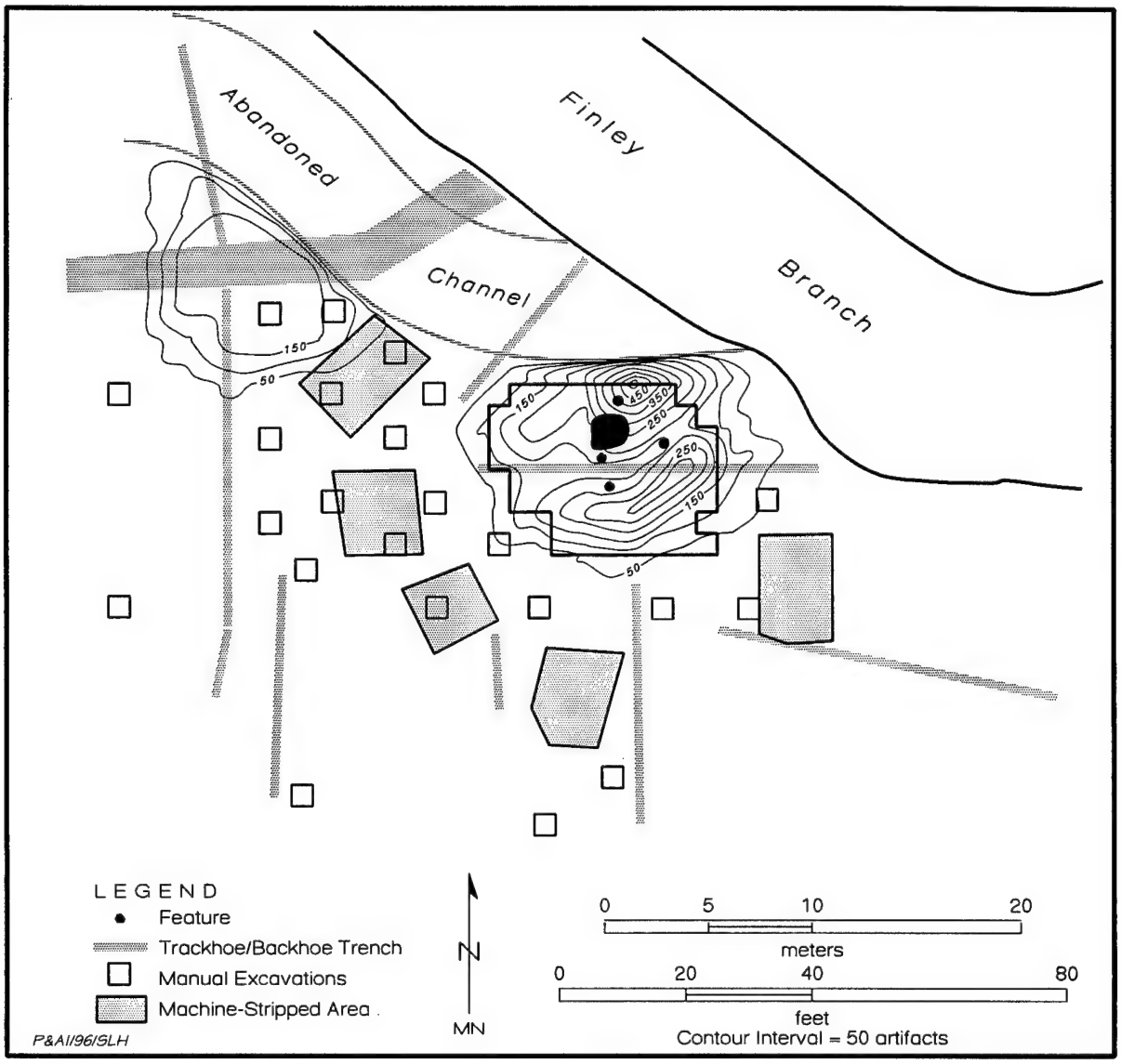


Figure 38. Plan of 41HP175 showing isopleths of artifact frequencies and feature locations.

8-m-wide area with low artifact frequencies, but various lines of evidence (i.e., stratigraphy, radiocarbon dates, and crossmending of ceramics) demonstrate convincingly that they were associated with one another.

The excavations focused on the eastern concentration and adjacent areas. The only features found there were a large hearth at its center associated with burned mud dauber nests and four possible posts or stakes to the north, east, and south. The artifacts exhibit a highly patterned distribution, occurring most densely in a 2-m-wide ring lying 1–2 m away from the hearth. This ring of debris coincided generally with the possible posts or stakes, with the area west of the hearth toward the western concentration having lower artifact densities. The heart of this eastern concentration covered an area of about 85 m^2. Although no midden staining was observed (probably because only one major occupation was represented), the high frequencies of lithics and especially sherds, with the latter representing at least 54 vessels, point to intensive use. This, coupled with the hearth-centered artifact distribution pattern, the four possible posts/stakes (perhaps supports for a brush arbor?), and the recovery of cultigens (maize and squash), allows the eastern

concentration to be interpreted as an outside activity area associated with an undocumented house. It is speculated that this house might be marked by the little-sampled artifact concentration to the west, although no postholes or other features were observed in the two units dug in this area or in the walls of the trenches that quarter-sectioned this concentration.

While lacking the concrete evidence for a domicile that would confirm this interpretation, the data recovered—i.e., the distributional patterning, the size of the eastern concentration, the nature of the features, the richness of the artifact assemblage, and the abundance of materials—indicate that the site probably was occupied on a permanent (or at least multiseasonal) basis for a relatively short span of time, almost certainly a generation or less. This limited reoccupation sets 41HP175 apart from the excavated early Caddoan sites at Cooper Lake, but 41HP175 may not differ substantially in other ways. For example, 41HP175 apparently supported no more than a single household, and the same argument can be made for the earlier components at 41DT11 and 41HP106.

Ranges of Activities

The objective of this section is to offer a broader perspective on how sites at Cooper Lake were used, since many of the excavated sites did not yield much useful information on intrasite structure. This is accomplished by assessing the ranges of activities that were performed using feature inventories and artifact breakdowns, with some sites yielding primarily feature data, some contributing mostly artifactual evidence, and some offering both.

Table 6 summarizes the feature data for those sites where features can be assigned to components most readily (including 41HP106 where some assignments are more tenuous than others). On a gross level, the presence of middens and a variety of kinds of features (especially hearths, pits, postholes, and human burials) at most of the more intensively investigated early Caddoan sites (41DT11, 41DT16, 41DT80, and 41DT124) and in the early and middle Caddoan components at 41HP106 points to a wide range of activities indicative of domiciliary, processing, and maintenance tasks. The early Caddoan contexts where this is not the case (i.e., at 41DT6, 41DT21, 41DT52, and 41DT63) saw relatively limited excavations, and this probably explains the limited numbers of features there.

Middens and features indicating broad ranges of activities are less common in the Woodland components, although this may be due in part to limited excavations and poor preservation of fragile features at some sites (e.g., pits and postholes may not have survived or been visible in the homogeneous sediments at 41DT62 and 41DT154). In fact, the features assigned to the Woodland component on the Southwest Rise at 41HP106 appear to represent a small cemetery associated with a locus of domestic activities, and this component may have been functionally comparable to the better-sampled early Caddoan residential components.

The most impoverished feature assemblages are those from the Archaic components at 41HP159 and the late Caddoan component at 41HP175. In the former case, this may be a true reflection of limited activity sets, since the artifacts indicate relatively short lived, ephemeral occupations. For 41HP175, however, the small number of features is probably in part a sampling problem, since the excavated area appears to represent a hearth-centered outside activity area associated with an undiscovered house.

Some of the ways in which ranges of activities are reflected in the artifacts are obvious. For example, Table 5 and Figures 29 and 31 show that ceramics are not only much more abundant in late Caddoan site 41HP175 than in the early Caddoan components, but the late ceramics also represent a larger number of vessel forms. Pottery was used much more frequently by late Caddoan peoples, and it probably served a greater variety of functions as well. This increased functional differentiation accords well with the interpretation that 41HP175 represents an occupation by a sedentary group. Although few in number, the ceramic pipe sherds also support this conclusion, since the seven specimens found at 41HP175 exceed the total of only four from early Caddoan contexts at 41DT6, 41DT16, and 41DT124. By far the largest collection of pipe fragments is from 41HP106 (n = 42), and while they have not yet been split out by component, it is reasonably certain that they belong with the early-middle Caddoan occupations represented by the structures on the North Rise and South Rise.

Less obvious differences can be seen in the bone/shell tool and ornament types, since these kinds of items were not preserved equally well in all sites. In fact, where they were preserved, the collections

TABLE 6
SUMMARY OF CULTURAL FEATURES

Site No.	Archaic	Woodland	Early Caddoan	Late Caddoan
41DT6	–	midden	midden	–
41DT11	–	–	midden 3 hearths 23 pits 33 postholes 1 ash concentration 1 log mold ?	–
41DT16	–	midden 2 pits 2 ash concentrations 1 posthole ?	midden 5 hearths 3 pits 2 ash concentrations 1 posthole ? 2 burials	–
41DT21	–	–	midden 1 hearth	–
41DT52	–	1 pit	none	–
41DT62	–	none	–	–
41DT63	–	–	midden 1 disturbed burial ?	–
41DT80	–	–	midden 6 hearths 20 large pits 13 pits/postholes 18 postholes 3 shell concentrations 1 rock hearth 6 burials	–
41DT124	–	–	midden 3 hearths 14 pits 11 postholes 1 burial	–
41DT154	–	none	–	–
41HP106	–	2 middens 2 rock hearths 10 pits 9 postholes 14 burials	5 middens 4 hearths 25 large pits 21 small pits 122 postholes 7 burials 1 dog burial	–
41HP159	12 rock hearths	–	–	–
41HP175	–	–	–	1 hearth 4 posts/stakes ?

NOTE: Includes only features that can be assigned to components, including some from machine-excavated areas outside of controlled excavations. For 41HP106, most of the features on the Southwest Rise and those associated with the primary midden on the North Rise are assigned to the Woodland period, while the remainder of those on the North Rise, those associated with Structures A and B on the South Rise, and two Southwest Rise features are assigned to the early Caddoan period (recognizing that some actually date to the middle Caddoan period). "None" indicates that a component was identifiable but no features were present; a dash indicates that a component was not present or not identifiable.

of these kinds of artifacts are all broadly similar and point to a variety of processing, manufacture, maintenance, and nonutilitarian tasks. For example, substantial numbers of bone tools were recovered from the Woodland components at 41DT6 and 41DT16 and the early Caddoan components at 41DT6, 41DT11, 41DT16, 41DT80, 41DT124, and 41HP106, and most or all of the collections contain items such as awls/pins, worked antlers, beamers, astragalus pestles, decorated pieces, and beads/bead preforms (these are not tabulated here because differences in analytical schemes make direct comparisons difficult). Even the much smaller collection from late Caddoan site 41HP175 contains a variety of kinds of implements suggestive of varied activities, i.e., awls/pins, worked antlers, a beamer, striated turtle shells, and a musical rasp.

Most of the artifactual evidence concerning ranges of activities comes from the stone artifacts, since these occur ubiquitously and in large numbers and are not affected by preservational biases. Table 7 shows that all of the shaped chipped stone collections are broadly similar, especially considering the differences in sample sizes (i.e., there is a positive correlation [r = 0.71] between sample size and the number of categories). All are dominated by nontool bifaces (i.e., unfinished tools and manufacturing failures) and projectile points, suggesting an overall emphasis on tool manufacture/maintenance and procurement (i.e., hunting). Processing activities may be represented by most or all of the other, consistently infrequent tool types (e.g., perforators, gouges, other bifacial tools, unifaces, wedges, and choppers).

The most conspicuous variability evident in Table 7 stems from the introduction of the bow and arrow during the Caddoan period, and many of the smaller scale differences probably are related to varying sample sizes. There are a few differences between assemblages that are notable, however. For example, the late Archaic collection from 41HP159 has relatively high percentages of large gouges, nontool bifaces, and shaped unifaces, while projectile points and preforms are relatively infrequent. The late Caddoan assemblage from 41HP175 stands out in its relatively high percentages of projectile points, small gouges, and unifaces and its low percentage of nontool bifaces. The Woodland and early Caddoan collections tend to have moderate to high frequencies of projectile points, moderate percentages of large gouges and nontool bifaces, and low frequencies of unifaces. Some of these probably represent variability in the importance of such activities as hunting (i.e., projectile points), hide processing (i.e., unifaces), and the manufacture of dart points and other large bifaces (i.e., nontool bifaces), while the functional correlates of some of the others are more difficult to discern.

In any case, the comparably broad ranges of tool types across components (allowing for different sample sizes) suggest comparably broad ranges of procurement, processing, and manufacture/maintenance activities. This lack of large-scale differentiation is illustrated in Figure 39, which plots the percentages of projectile points (arrow and dart points) against those of manufacture-related items (nontool bifaces and preforms) and other tools (perforators, gouges, other bifaces, unifaces, wedges, and choppers). Most of the collections cluster tightly in one area of the graph, with the two most divergent ones (the middle Archaic component at 41HP159 and the early Caddoan component at 41DT63) probably being due to small sample sizes.

The greatest variability in the chipped stone collections can be seen at a more general level and pertains to two main issues. First, the collections from the Archaic components at 41HP159 (especially the late Archaic) are the only ones where expedient tools outnumber shaped tools (Table 8). Expedient tools are relatively infrequent in all of the later collections, although there is substantial variability among the Woodland and Caddoan components in the relative amounts of these two tool groups. The infrequency of shaped tools in the Archaic components suggests that these occupations were short lived relative to the later ones, i.e., the lengths of the individual Archaic occupations tended not to exceed the use lives of shaped tools, while the opposite was true for the Woodland and Caddoan occupations.

The variability evident among the later components is intriguing but not easy to interpret. The ratios of shaped to expedient tools range widely for both the Woodland components (1.0:1 to 6.1:1) and the early Caddoan components (1.1:1 to 7.5:1), with the late Caddoan component at 41HP175 having a moderate value (2.4:1); hence, there is no clear time-related trend. Given the possibility of biases stemming from the small sizes of some collections and the fact that the sites were sampled in varying ways, perhaps the most important thing to note about these ratios is that the mean values for the Woodland

TABLE 7

SUMMARY OF SHAPED CHIPPED STONE TOOL ASSEMBLAGES

Site	Arrow Point	Arrow Point Preform	Dart Point	Dart Point Preform	Perforator	Large Gouge	Small Gouge	Bifacial Tool	Nontool Biface	Shaped Uniface	Wedge	Chopper	Totals
MIDDLE ARCHAIC													
41HP159	0 (0%)	0 (0%)	3 (21%)	0 (0%)	0 (0%)	1 (7%)	0 (0%)	1 (7%)	6 (43%)	0 (0%)	1 (7%)	2 (14%)	14
LATE ARCHAIC													
41HP159	0 (0%)	0 (0%)	32 (29%)	0 (0%)	0 (0%)	10 (9%)	2 (2%)	2 (2%)	54 (49%)	7 (6%)	3 (3%)	1 (1%)	111
WOODLAND													
41DT6	7 (4%)	3 (2%)	54 (31%)	19 (11%)	3 (2%)	7 (4%)	6 (3%)	1 (1%)	65 (37%)	1 (1%)	8 (5%)	0 (0%)	174
41DT16	12 (4%)	6 (2%)	118 (35%)	30 (9%)	4 (1%)	15 (4%)	12 (4%)	4 (1%)	119 (36%)	6 (2%)	3 (1%)	6 (2%)	335
41DT52	4 (6%)	1 (1%)	19 (26%)	0 (0%)	0 (0%)	2 (3%)	1 (1%)	0 (0%)	36 (50%)	5 (7%)	3 (4%)	1 (1%)	72
41DT62	3 (2%)	1 (1%)	56 (34%)	16 (10%)	2 (1%)	10 (6%)	0 (0%)	3 (2%)	71 (43%)	1 (1%)	1 (1%)	0 (0%)	164
41DT154	4 (6%)	1 (1%)	23 (32%)	8 (11%)	0 (0%)	1 (1%)	0 (0%)	0 (0%)	34 (47%)	1 (1%)	0 (0%)	0 (0%)	72
EARLY CADDOAN													
41DT6	57 (19%)	16 (5%)	58 (20%)	15 (5%)	6 (2%)	9 (3%)	31 (11%)	2 (1%)	89 (30%)	1 (<1%)	9 (3%)	2 (1%)	295
41DT11	325 (32%)	138 (13%)	83 (8%)	44 (4%)	7 (1%)	38 (4%)	30 (3%)	13 (1%)	326 (32%)	14 (1%)	3 (<1%)	3 (<1%)	1,024
41DT16	202 (31%)	95 (15%)	98 (15%)	33 (5%)	10 (2%)	16 (2%)	28 (4%)	7 (1%)	154 (24%)	8 (1%)	3 (<1%)	1 (<1%)	655
41DT21	43 (27%)	13 (8%)	13 (8%)	1 (1%)	2 (1%)	3 (2%)	1 (1%)	2 (1%)	77 (48%)	5 (3%)	0 (0%)	0 (0%)	160
41DT52	23 (27%)	5 (6%)	8 (10%)	1 (1%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	44 (52%)	2 (2%)	0 (0%)	0 (0%)	84
41DT63	17 (40%)	4 (9%)	6 (14%)	1 (2%)	0 (0%)	2 (5%)	1 (2%)	0 (0%)	12 (28%)	0 (0%)	0 (0%)	0 (0%)	43
41DT80	124 (33%)	63 (17%)	25 (7%)	1 (<1%)	4 (1%)	0 (0%)	6 (2%)	4 (1%)	149 (39%)	2 (1%)	2 (1%)	0 (0%)	380
41DT124	147 (39%)	37 (10%)	15 (4%)	8 (2%)	3 (1%)	1 (<1%)	1 (<1%)	9 (2%)	155 (41%)	4 (1%)	0 (0%)	1 (<1%)	381
LATE CADDOAN													
41HP175	126 (37%)	43 (13%)	4 (1%)	1 (<1%)	0 (0%)	3 (1%)	26 (8%)	4 (1%)	100 (29%)	30 (9%)	3 (1%)	4 (1%)	344

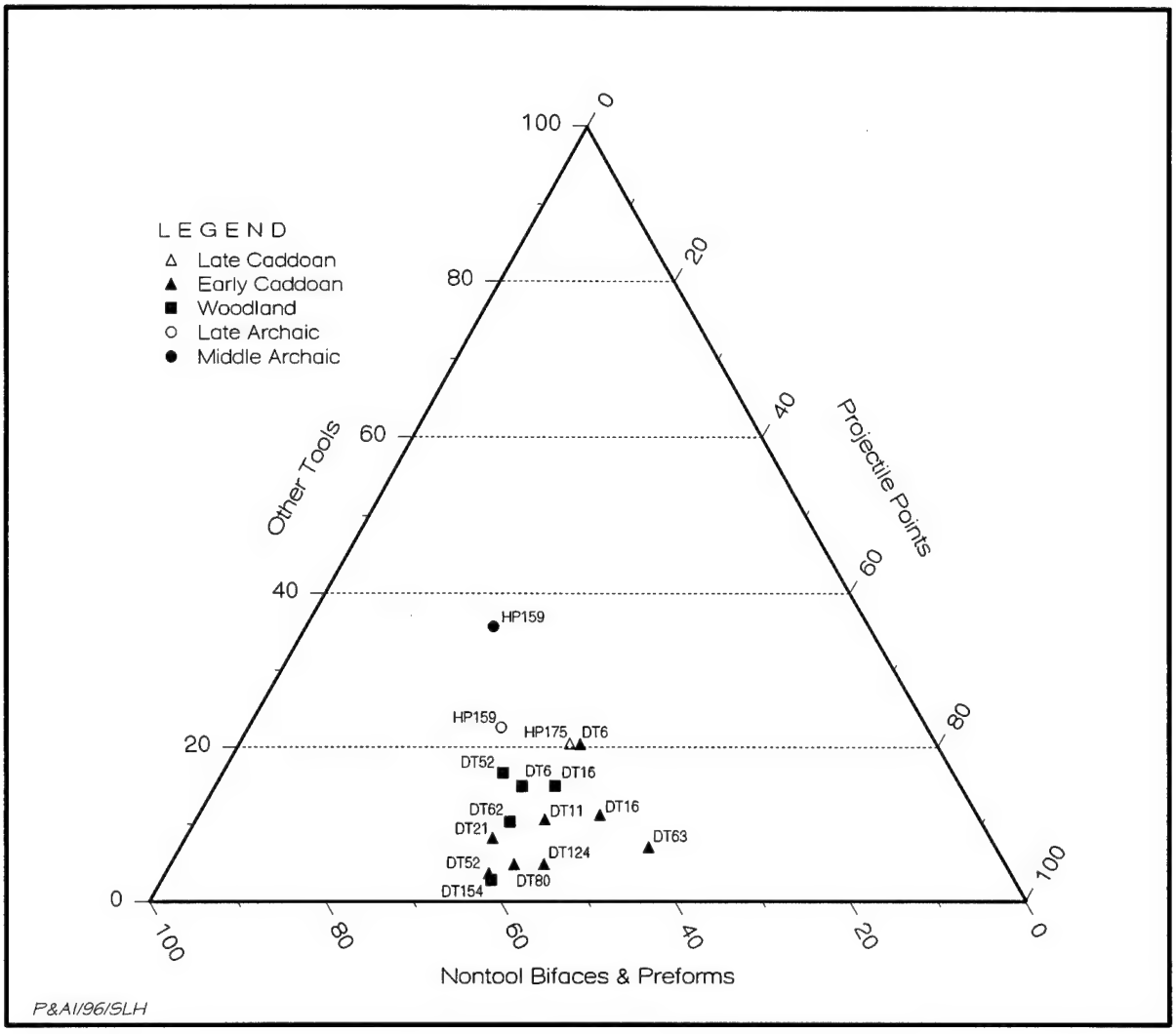


Figure 39. Triangle graph plotting the percentages of projectile points, manufacture-related chipped stone items, and other chipped stone tools.

(3.5:1) and early Caddoan (2.7:1) periods, along with the value of 2.4:1 for the single later collection, all exceed 1:1 by a substantial amount. This suggests that, overall, these occupations were of longer duration than the Archaic ones, and this implies that the later occupations saw wider ranges of activities than the earlier ones.

The sites also show substantial variability in the relative amounts of shaped chipped stone tools and unmodified debitage (Figure 40). For the Woodland and Archaic components combined, the correlation between the frequencies of these two artifact classes is quite high (r = 0.96), and thus it appears that there is a consistent relationship between the numbers of tools produced and the debris resulting from tool production. The collections from the early Caddoan components present a somewhat different picture, however, in that they are more variable (r = 0.81) and shaped tools tend to be relatively frequent. The higher incidence of tools may reflect a greater focus on tool use and discard than tool manufacture, and this may indicate more off-site tool manufacture or, perhaps more likely, that the early Caddoan occupations were relatively long lived, once again implying greater ranges of activities. The variability among the early Caddoan components may point to differences in how the sites were used (e.g., occupations of different length or at different seasons), or it may relate to varying success in isolating the early Caddoan components at some sites (e.g., 41DT6,

TABLE 8

SUMMARY OF CHIPPED STONE ARTIFACTS

Site No.	Shaped Tools	Expedient Tools	Cores	Unmodified Debitage
MIDDLE ARCHAIC				
41HP159	14	15	6	428
LATE ARCHAIC				
41HP159	111	231	76	2,510
WOODLAND				
41DT6	174	59	36	6,673
41DT16	335	55	92	10,109
41DT52	72	61	34	1,693
41DT62	164	27	38	3,113
41DT154	72	69	23	2,048
EARLY CADDOAN				
41DT6	295	98	26	7,146
41DT11	1,024	365	164	10,120
41DT16	655	87	63	11,688
41DT21	160	73	26	1,197
41DT52	84	76	18	3,299
41DT63	43	27	7	310
41DT80	380	166	20	2,066
41DT124	381	277	77	2,954
LATE CADDOAN				
41HP175	344	143	219	13,365

NOTE: Expedient tools include modified flakes, expedient unifaces, indeterminate uniface fragments, and burins.

41DT16, and 41DT52).

The position of the late Caddoan component at 41HP175 on Figure 40 might seem anomalous given the other evidence that the site saw long-term, perhaps even year-round, use. This site stands out on technological grounds, however, and this probably explains the abundance of debitage at 41HP175. Specifically, this site is the only one where the production of projectile points focused exclusively (or nearly so) on arrow points rather than dart points. The manufacture of large numbers of small tools is reflected in the small size of the debitage from this site and the relatively high percentage of chips (distal flake fragments) as opposed to complete and proximal flakes (Fields et al. 1993:240). This shift to a greater focus on tool production using small flake blanks is marked further by the fact that the high ratio of cores to shaped tools at 41HP175 (0.63:1) reverses the trend evidenced by the mean values for the Archaic (0.56:1), Woodland (0.30:1), and early Caddoan (0.14:1) components. Apparently, the decreased production of large bifaces for tools and tool blanks (which also produced flake blanks for the manufacture of small tools during earlier time periods) resulted in an increased need for multifaceted core reduction to produce small flake blanks during the late Caddoan period.

Most of the analyzed components also yielded stone artifacts modified by grinding, pecking, and/or battering (Table 9). Grinding stones (slabs, anvils, and manos), hammerstones, and pitted stones tend to occur most frequently, but other kinds of tools (abraders, pigment stones, an atlatl weight, a celt, a piece of modified kaolin) and debitage from tool

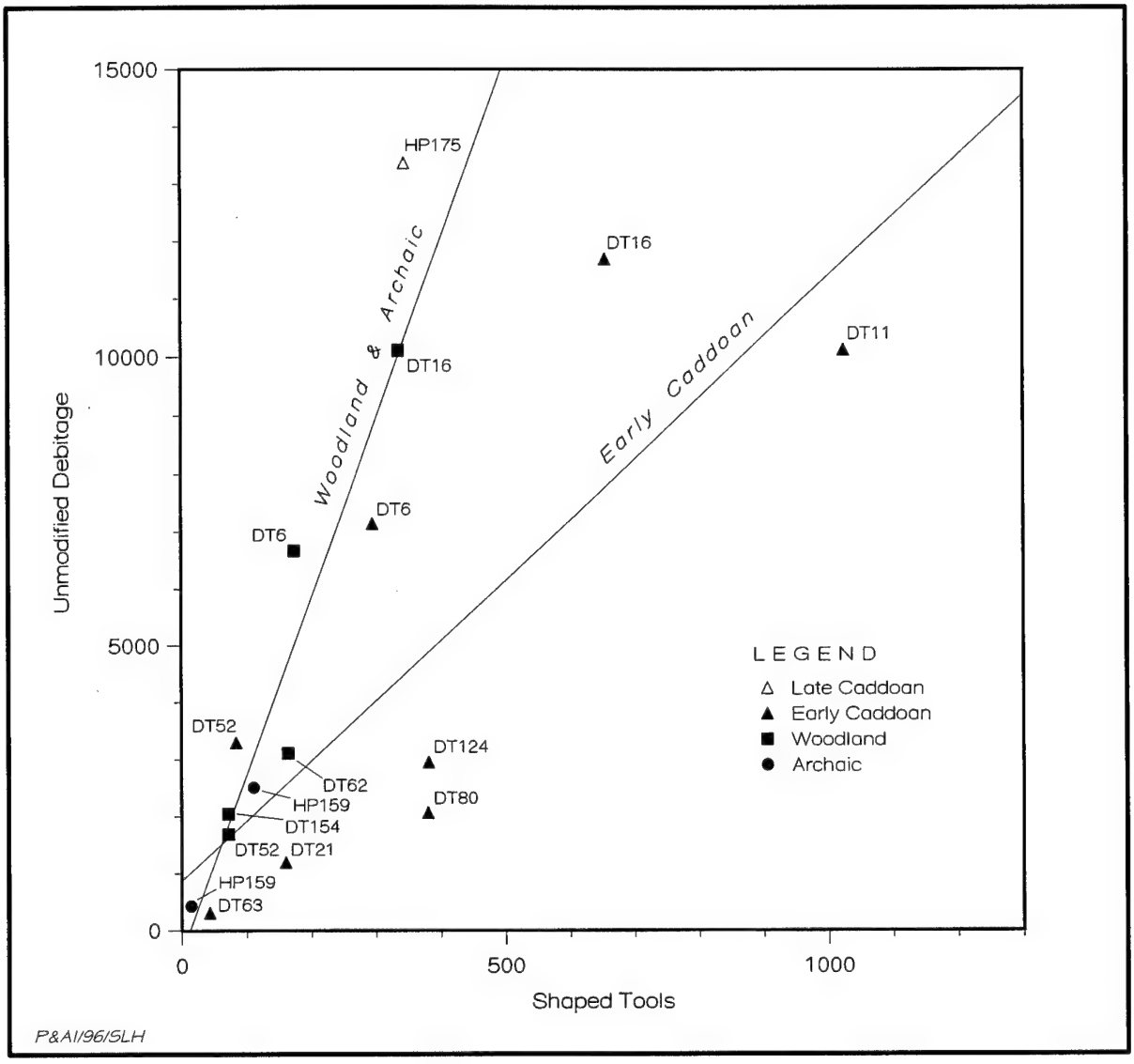


Figure 40. Graph of numbers of shaped tools and unmodified debitage by component; the linear regressions are based on two data sets consisting of the early Caddoan components and the combined Woodland and Archaic components.

manufacture occur as well. While some components contained a number of these artifacts and others yielded few or none, this variability probably has more to do with the overall infrequency of these items and sampling problems than with differences in the activities performed. At a general level, however, this class of artifacts shows that a variety of processing, manufacture, maintenance, and non-utilitarian tasks were performed.

Use Intensity

The information discussed above implies that Native Americans used the Cooper Lake area in an increasingly intensive fashion through time, at least through the first half of the Caddoan period. This trend is summarized here using an index of use intensity (total number of shaped and expedient chipped stone tools/m² of manual excavations/ primary occupation span in millenia[1]) that is

[1]Because some components are dated better than others, standardized occupation spans are used for the Woodland (200 B.C. to A.D. 800), early Caddoan (A.D. 800–1300), and late Caddoan (A.D. 1400–1600) periods. Site-specific spans are used for the Archaic components at 41HP159 (4450–3250 B.C. and 1650–150 B.C.).

TABLE 9

SUMMARY OF GROUND, PECKED, AND BATTERED STONE ARTIFACTS

Period	Site	Grinding Stones	Hammer-stones	Pitted Stones	Abraders	Pigment Stones	Other
Middle Archaic	41HP159	2	0	0	0	0	
Late Archaic	41HP159	5	3	0	0	1	
Woodland	41DT6	3	4	0	0	0	
	41DT16	11	4	2	0	1	1 atlatl weight
	41DT52	1	0	0	0	0	
	41DT62	3	2	1	0	0	
	41DT154	0	0	0	0	0	
Early Caddoan	41DT6	1	1	1	1	0	
	41DT11	19	9	4	1	1	3 flakes; 49 indeterminate fragments
	41DT16	14	3	2	1	2	
	41DT21	3	2	0	1	0	
	41DT52	0	0	0	0	0	
	41DT63	1	0	0	0	0	1 flake
	41DT80	3	4	1	1	2	
	41DT124	1	2	0	0	0	
Late Caddoan	41HP175	4	10	9	5	0	1 celt; 1 kaolin lump

NOTE: Grinding stones include items classified as slabs, anvils, and manos, with some of the latter showing battering indicating use also as hammerstones; hammerstones listed here show no evidence of use other than battering; some pitted stones have grinding and/or battering indicating use for multiple functions.

intended to account for differences in area excavated and occupation span between the 16 analytical units at the 12 sites. The primary assumption underlying the use of this index is that, despite variability in lithic technology through time and across space, there is a positive correlation between the number of tools deposited on a site and the aggregate length of time the site was occupied. Of course, this measure must be viewed as a gross approximation given the problems of dating the archeological remains at some of these sites, the certainty that not all components have been isolated equally well, and differences in sampling strategies between sites. Another factor that could contribute to perceived differences in use intensity, i.e., differences in group size, appears not to be relevant here since the data from several sites, especially 41DT11, 41HP106, and 41HP175, suggest that most occupations were by single, small social groups.

As Figure 41 shows and as could be predicted from the feature and artifact evidence, the use intensity index values get consistently larger from the middle Archaic period through the early Caddoan period, dropping during the late Caddoan period. The single component that does not follow this pattern is 41DT154; as this Woodland site was

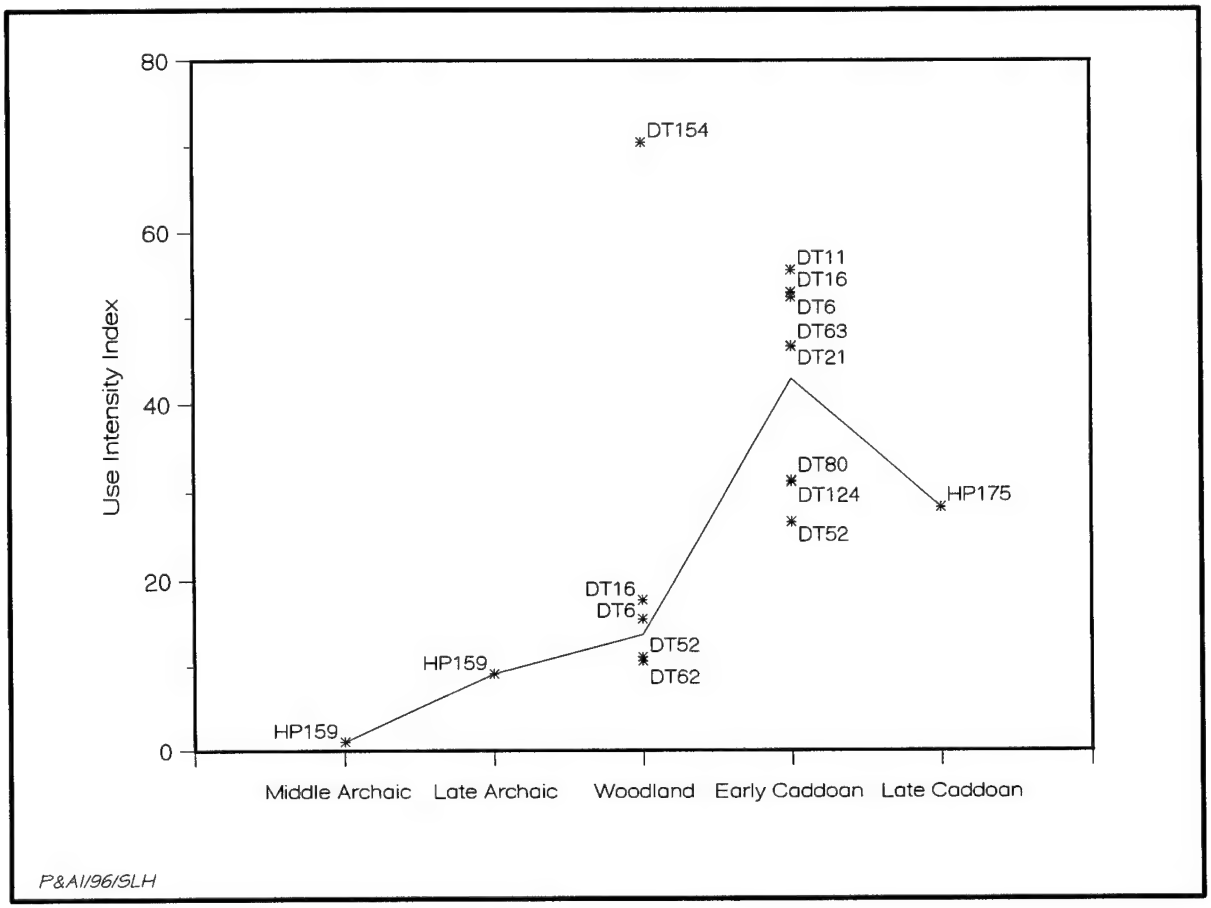


Figure 41. Graph of use intensity by time period; the line showing mean values excludes 41DT154 because its aberrant value may be due to the limited excavations.

explored using only two 1-x-1-m units, however, this discrepancy probably can be attributed to sampling error.

The trends in Figure 41 appear to reflect changes in how frequently sites were occupied and how long the individual occupations lasted, ranging from short-term (albeit still residential) and infrequent use during the middle Archaic period to at least seasonal (and longer in some cases), multigenerational occupation during the early and middle Caddoan periods. The decrease during the late Caddoan period can be attributed to the fact that 41HP175, while probably occupied on a multiseasonal or year-round basis, saw only a single episode of use rather than the protracted occupation spans evident at many of the earlier Caddoan sites. Also contributing to the picture for the late Caddoan period, though, was a more fundamental change in settlement strategies that is hard to see in the archeological record. Specifically, small numbers of late artifacts occur at many sites that predominantly predate ca. A.D. 1300 (e.g., 41DT1, 41DT6, 41DT16, 41DT21, 41DT37, 41DT52, 41DT54, 41DT63, 41DT80, 41DT124, 41HP102, and 41HP106), and because of their small numbers these artifacts suggest that most of the late components in the project area represent nonintensive, presumably limited-purpose use. Thus, there is reason to question whether the single excavated and analyzed residential component is typical for the area. Rather, it appears that settlement systems during the late Caddoan period may have entailed limited numbers of residential sites but relatively large numbers of limited-function procurement/processing sites. This implies an increase in logistical mobility over the early Caddoan period. The paucity of middle Caddoan components at Cooper Lake, with the intensively used residential occupation on the South Rise at 41HP106 being the only excavated example, suggests that this change may have been

underway perhaps a century before 41HP175 was occupied.

SUBSISTENCE

Direct data on subsistence are especially abundant for the Caddoan period and less so for the Woodland period. Substantial quantities of analyzed faunal remains are available from isolable components at five sites (41DT6, 41DT11, 41DT16, 41DT80, and 41DT124), with a small but informative sample coming from a sixth (41HP175). Faunal remains were recovered and identified from 41DT21, 41DT52, and 41DT63, but they were not quantified in a way that allows comparisons with the other collections. Potentially useful faunal samples were recovered from a number of other sites as well (especially 41HP78 and 41HP106), but they are not considered here since components have not been isolated fully. Informative samples of macrobotanical remains are available from a number of sites, especially 41DT6, 41DT11, 41DT16, 41DT80, 41DT124, and 41HP175. Site 41HP106 produced a large and potentially important macrobotanical sample but has not yet been fully analyzed. Smaller samples were recovered from dated contexts at 41DT21, 41DT62, 41DT63, 41HP137, and 41HP159, and these contribute more-limited information. The third line of evidence pertaining to subsistence comes from the human skeletal remains.

As Table 10 shows, a wide variety of vertebrate taxa were found at the Cooper Lake sites, with the differences between the assemblages probably having more to do with sample size (especially at 41HP175) and degree of fragmentation (especially in the relatively comminuted sample from 41DT11). Based on the numbers of identified specimens, it is clear that white-tailed deer was the primary source for animal protein during the Woodland, early Caddoan, and late Caddoan periods. Deer and unidentified artiodactyl bones combined (most of the latter certainly represent deer, since so few other artiodactyls were identified) constitute 29–32 percent of the collections (excluding bones classifiable only as unidentified mammal or unidentified vertebrate) from the Woodland component at 41DT16 and the early Caddoan components at 41DT11, 41DT16, and 41DT80, while deer is even more prominent, at 39–43 percent, in the Woodland component at 41DT6 and the early Caddoan components at 41DT6 and 41DT124. The figure is dramatically higher for 41HP175 (71 percent), but this probably is due to the poorer preservation of faunal materials there (i.e., the more fragile bones of fish, birds, and small mammals survived less frequently).

Of secondary importance during all time periods were the various small mammals (especially cottontail rabbit, raccoon, swamp rabbit, and squirrels), box turtles, and birds (especially turkey) that are likely to have frequented the riparian woodland and woodland-edge habitats of the Sulphur River bottoms and adjacent valley margins. Together, these taxa (excluding those that may not have been subsistence related, such as the small rodents and the canids, and some of the birds, which may have been taken from a variety of habitats) constitute moderate percentages (11–17 percent) of the collections from the two Woodland components and the early Caddoan components at 41DT6, 41DT16, and 41DT80. The bones of these animals are more common at 41DT124 (23 percent) and less common at 41DT11 and 41HP175 (8 percent at both), with the low figures perhaps being a function of the relatively poor preservation of small elements.

Most of the other bones represent aquatic taxa procured from the Sulphur River or its tributaries. Several kinds of turtles are most important among these, although fish, amphibians, and water snakes are present also. Aquatic taxa are most common in the early Caddoan components at 41DT80 and 41DT124 (9 percent) and least common at 41HP175 (4 percent), with the low value for 41HP175 once again probably being due to poor preservation; the other components have moderate values of 5–6 percent. Terrestrial snakes and other reptiles, migratory and nonmigratory waterfowl, and a few prairie species (i.e., prairie chicken, jackrabbit, pronghorn, and bison) round out the collections in generally small numbers, and they were of little dietary importance.

Also found at all of the sites shown in Table 10, except at 41HP175 where their absence may be explained by the lack of a midden and hence unfavorable preservation conditions, were freshwater mussel shells. Their ubiquitous occurrence suggests that mussels were a significant contributor to the diet, a conclusion that is strengthened by the discovery of a pit containing 13.6 kg of shells in the early Caddoan component at 41DT16. There is no evidence that mussels were any more or less important during any particular time period, however.

In short, all of the faunal collections point to

TABLE 10
SUMMARY OF VERTEBRATE FAUNAL REMAINS

	Woodland		Early Caddoan					Late Caddoan
Taxon	41DT6	41DT16	41DT6	41DT11	41DT16	41DT80	41DT124	41HP175
FISH								
Gar	1				1	4	3	
Bowfin	2	1	3		3	5	6	
Catfish			1		4	8	13	
Drum		1	5					
Suckerfish						1		
Bass/sunfish					1	6	9	
Unidentified	9	2	4	1	1	18	33	
TOTAL	12	4	13	1	10	42	64	
AMPHIBIANS								
Bullfrog	3		2			2	1	
Frog	1			1			4	
Frog/toad	1	4	2	6	1	2		
Amphiuma	1		4				1	
Salamander		1	1			1	1	
Unidentified				1				
TOTAL	6	5	9	8	1	5	7	
REPTILES, TURTLES								
Snapping turtle	7	1	3	2	4	22	28	
Slider turtle	18	9	13	2	8	33	23	7
Pond/map turtle	17	65	7		28	1		
Mud/musk turtle	67	196	61	112	251	314	204	3
Box turtle	158	328	106	51	115	513	569	17
Softshell turtle	3	9	3			4	1	
Unidentified	894	2,195	823	1,431	1,540	1,621	1,698	45
TOTAL	1,164	2,803	1,016	1,598	1,946	2,508	2,523	72

Table 10, continued

	Woodland		Early Caddoan					Late Caddoan
Taxon	41DT6	41DT16	41DT6	41DT11	41DT16	41DT80	41DT124	41HP175
REPTILES, SNAKES								
Racer	2							
King/milk snake							2	
Hognose snake		1						
Garter snake			1				1	
Rat snake	1	1	3					
Rat/corn snake							3	
Water snake					2	5	8	
Nonvenomous snake	6	14	3	13	7	11	44	
Cottonmouth		1	1		2	2	2	
Copperhead						1		
Rattlesnake	4	5			6	4	1	
Viper	8	14	2	2	12	26	36	
Unidentified	13	14	8	5	7	14	38	
TOTAL	34	50	18	20	36	63	135	
REPTILES, OTHER								
Skink			1					
Racerunner						1		
Unidentified lizard							2	
TOTAL			1			1	2	
BIRDS								
Teal duck					1			
Shoveler							1	
Mallard		2	3				1	
Wood duck							1	
Gadwall	1				1			
Goose						1	2	
Duck/goose	1					1	2	
Vulture						1		

Table 10, continued

	Woodland		Early Caddoan					Late Caddoan
Taxon	41DT6	41DT16	41DT6	41DT11	41DT16	41DT80	41DT124	41HP175
BIRDS (continued)								
Hawk		1	1			2	8	
Heron/bittern	1				1		2	
Purple gallinule	1							
Wood ibis							1	
Avocet							1	
Prairie chicken			1		2	4	16	
Turkey	11	38	13	14	19	49	88	
Bobwhite quail	1	1			1		5	
Passenger pigeon		1						
Owl			1		1		3	
Red-winged blackbird							1	
Common crow	2						2	
Unidentified	18	57	18	38	38	72	98	3
TOTAL	36	100	37	52	64	130	232	3
MAMMALS								
Opossum	8	19	6		14	14	36	1
Shrew/mole		3			3		15	
Armadillo						19	2	
Cottontail	35	134	68	114	144	111	615	3
Swamp rabbit	7	44	6		25	1		
Jackrabbit	3		1	2	2	58	6	
Swamp/jackrabbit	10	50	10		48		43	
Gray squirrel		2				1	1	
Fox squirrel		3				1		
Tree squirrel	7	19	5	3	54	48	94	
Squirrel/chipmunk				5				
Pocket gopher	17	24	13	2	36	78	84	
Vole	8		8	8	1	13	30	

Table 10, continued

	Woodland		Early Caddoan					Late Caddoan
Taxon	41DT6	41DT16	41DT6	41DT11	41DT16	41DT80	41DT124	41HP175
MAMMALS (continued)								
Pocket mouse		1	1		3	5	3	
Deer/white-footed mouse						1	1	
Beaver	5	9	9		19	9	7	
Muskrat					5			
Wood rat		1						
Cotton rat	2	5	5		10	2	27	
Unidentified rodent	15	7	12	8	4	20	33	
Striped skunk					1	3	10	
Spotted skunk							2	
Otter					1			
Mink		3	1		4	9	16	
Mink/weasel				9		3	10	
Raccoon	49	74	31	13	42	27	69	1
Gray fox	8	1			5	7	5	
Fox					1			
Dog		1	2		1			
Coyote		2	2					
Dog/coyote	1	22	4	4	4	6	34	
Bobcat	1	5				1	4	
Unidentified carnivore	5	6	4	11	10	3	1	
Bison		3						1
Deer	299	397	260	276	301	1,326	2,606	155
Pronghorn		3	2	1	2		4	1
Elk				1				
Unidentified artiodactyl	773	1,186	636	512	712	2	5	47
Unidentified mammal	32	66	29	14,887	51	102	220	21
TOTAL	1,285	2,090	1,115	15,856	1,503	1,870	3,983	230
Unidentified Vertebrate	10,090	16,770	10,885	631	15,092	ca. 10,761	ca. 18,861	1,757

diverse procurement strategies and primary exploitation of woodland, woodland-edge, and aquatic environments within and adjacent to the Sulphur River valley. The most divergent collection, that from 41HP175, contains a limited number of taxa, but this probably is due to its small size and differential preservation. Temporal differences between the Woodland and early Caddoan components are not pronounced, and there are no indications that hunting strategies or the kinds of resources procured changed during this interval. Grasslands taxa that may have been taken from the upland prairies beyond the valley are consistently infrequent, and data pointing to a substantial reliance on bison are lacking, even in the late Caddoan component at 41HP175.

The macrobotanical evidence, summarized in Table 11, is difficult to interpret in some respects because only the early Caddoan components have been sampled with any intensity and because of the inherent problems of quantifying these kinds of data and relating them to dietary importance. Nonetheless, the remains recovered suggest that plant procurement focused on a variety of hardwood nuts, starchy and oily seeds, fruits, and roots. Cultigens, i.e., squash and maize, are present in most of the more intensively sampled early Caddoan collections, but their scant occurrence provides little support for the development of an agricultural economy during this time period.

For example, 41DT11 yielded small quantities of maize cobs and cultivated squash rind fragments from only 3 features, 41DT16 yielded just 12 squash fragments from 2 features, 41DT80 yielded a minute quantity (0.03 g) of maize from 3 features and 0.66 g of squash from 16 features, and 41DT124 yielded 0.07 g of maize from 4 features and 0.8 g of squash from 16 features. It is unclear if the more common occurrence of squash than maize indicates greater reliance on the former or, perhaps more likely, preservation differences. In any case, the data suggest that the early Caddo practiced horticulture to supplement their diet of wild plant foods. While some of the seeds from the early Caddoan sites (e.g., sunflower, maygrass, sumpweed, and knotweed) are associated with the pre-maize agricultural complex of the Eastern Woodlands, the morphological changes characteristic of wild plants subjected to plant husbandry are not apparent in these collections. Thus, it appears that wild, rather than domesticated, varieties were collected and utilized.

The data from the later context at 41HP175 are sparser, particularly in the lack of starchy or oily seeds, but this probably is due to sampling and preservation problems rather than differences in subsistence. Hickory nutshells dominate the collection, with other hardwood nutshells, seeds of locust and hackberry trees, maize, squash, and *Pediomelum* being present in small quantities. This suggests that the subsistence pattern indicated by the macrobotanical evidence for the early Caddoan period, i.e., a focus on wild plants with limited horticulture, persisted into the late Caddoan period.

The limited recovery of plant remains from Woodland contexts complicates reconstruction of subsistence for that period, but the available data do hint at the importance of hardwood nuts and the storage root *Pediomelum*. Most important, however, is the occurrence of cultivated squash rind fragments in a dated feature at 41HP137. These are the earliest cultigens found in the area, and they demonstrate convincingly that horticulture began to supplement wild plant foods in the diet before the Caddoan period.

The earliest plant remains from Cooper Lake consist of very small quantities of hickory nutshells and cf. *Pediomelum* rhizome fragments from a dated feature (Feature 1, 4800 ± 90 B.P.) stratigraphically between the two identified Archaic components at 41HP159. The only interesting thing about this sample is the presence of the rhizome fragments, which can be interpreted in two ways. First, the great age of the feature and the very poor preservation of organic materials at 41HP159 overall open up the possibility that the rhizome fragments are intrusive rather than archeological, and this in turn would cast doubt on the reliability of these kinds of remains at the other sites. On the other hand, if these fragments are truly archeological, they indicate that the utilization of this resource, which has been found so widely in archeological sites across the region in recent years, has a long history spanning the late Holocene and part of the middle Holocene.

As summarized in Appendix D, the human remains from Cooper Lake provide some information concerning subsistence, especially for the early Caddoan period and the early part of the middle Caddoan period. Unfortunately, data for the Woodland period are scarce because many of the burials possibly dating to this time are poorly preserved cremations or secondary interments, while others

TABLE 11

SUMMARY OF MACROBOTANICAL REMAINS

Site	Nuts	Seeds	Cultigens	Storage Roots
ARCHAIC				
41HP159	hickory	–	–	cf. *Pediomelum*
WOODLAND				
41DT6	hickory	vetch/peavine	–	*Pediomelum*
41DT16	hickory acorn	–	–	*Pediomelum*
41DT62	hickory pecan acorn	wild plum	–	-
41HP137	hickory acorn	–	squash	cf. *Pediomelum*
EARLY CADDOAN				
41DT6	hickory	vetch/peavine hackberry	–	–
41DT11	hickory pecan	sumpweed knotweed sedge pigweed honey locust sunflower wood sorrel maygrass wild plum grape Poaceae *Rubus*	squash maize	*Pediomelum*
41DT16	hickory acorn	vetch/peavine *Chenopodium* maygrass sunflower knotweed grape honey locust hackberry *Rubus*	squash	*Pediomelum*
41DT21	hickory	*Chenopodium*	–	–
41DT63	hickory	–	–	–
41DT80	hickory pecan acorn	sumpweed vetch/peavine *Chenopodium* knotweed bedstraw sedge *Rubus*	maize squash	cf. *Pediomelum*

Table 11, continued

Site	Nuts	Seeds	Cultigens	Storage Roots
41DT124	hickory pecan acorn	sumpweed vetch/peavine *Chenopodium* knotweed bedstraw sedge spurge bindweed *Rubus*	maize squash	cf. *Pediomelum*
LATE CADDOAN				
41HP175	hickory acorn pecan black walnut	honey locust water locust hackberry	maize squash	*Pediomelum*

cannot be assessed as Woodland with confidence (in fact, many or all of these could be early Caddoan). No human remains can be related to pre-Woodland or late Caddoan occupations.

The two kinds of evidence discussed in Appendix D that are most pertinent to subsistence are caries rates and the stable carbon isotope data (the nitrogen isotope data are not discussed here because their relevance to dietary reconstruction is not well understood). The overall caries rate for the Cooper Lake sample, 1.8 caries per individual (or 11 percent carious teeth), suggests moderate carbohydrate consumption, and this would be consistent with a diet that included maize but did not rely on it as a staple. On the other hand, the fact that the rates for the Woodland/early Caddoan burials (22 caries in 7 individuals for a rate of 3.1, or 23 percent carious teeth), the early Caddoan burials (24 caries in 16 individuals for a rate of 1.5, or 8 percent carious teeth), and the early-middle Caddoan burials (0 caries in 3 individuals) vary substantially and in a direction contrary to what would be expected (i.e., caries rates decrease through time rather than increase) raises doubts about how well this measure reflects maize consumption. Based on these data, it appears that the incidence of caries in the project area may have been controlled in part by factors other than the inclusion of maize in the diet, including relatively high dental attrition.

The carbon isotope data from 41HP106 also are puzzling. The $\delta^{13}C$ values from four individuals in three early Caddoan burials (ranging from –15.3 to –17.6), from one early-middle Caddoan burial (–15.2), and from one possible Woodland burial (–15.0) all are sufficiently high to suggest that C_4 plants, such as maize, contributed significantly to the diet. This is at odds with the scarceness of maize in the Caddoan macrobotanical samples and especially with the absence of maize in Woodland contexts at Cooper Lake. Given the limited number of burials for which isotope data are available, it is difficult to know how to interpret this information, and it is unlikely that the question will be resolved unless more isotope studies are done.

SOCIOCULTURAL INTERACTION

The topic of sociocultural interaction can be addressed using several lines of evidence. First, the analysis of the raw materials represented in the lithic artifacts indicates a heavy reliance on locally available quartzites for tool manufacture, with limited use of imported fine-grained cherts and novaculite. As Table 12 shows, materials identifiable as coming from nonlocal sources account for no more (and usually much less) than 16 percent of the projectile points from the 15 isolable components (excluding the very small sample from the middle Archaic component at 41HP159, where two of the three dart points are of nonlocal lithics), and the percentages are even smaller when all shaped chipped stone tools are considered. The fact that debitage of these materials is even less frequent indicates that these nonlocal items entered the Cooper Lake area as finished (or nearly finished) tools, with most subsequent flaking done to resharpen them. Nonlocal

TABLE 12

SUMMARY OF USAGE OF NONLOCAL MATERIALS IN THE CHIPPED STONE ARTIFACTS

	% of Projectile Points	% of All Shaped Tools	% of Debitage
MIDDLE ARCHAIC			
41HP159	66.7	14.3	1.8
LATE ARCHAIC			
41HP159	15.6	7.2	0.5
WOODLAND			
41DT6	4.9	2.9	0.3
41DT16	7.7	5.3	0.9
41DT52	4.3	*	*
41DT62	3.4	3.6	12.1
41DT154	3.7	*	*
EARLY CADDOAN			
41DT6	4.3	3.0	0.7
41DT11	4.2	2.1	1.6
41DT16	1.7	1.1	0.7
41DT21	1.8	*	*
41DT52	6.5	*	*
41DT63	0	*	*
41DT80	4.0	*	*
41DT124	4.3	*	*
LATE CADDOAN			
41HP175	0.8	0.3	0.1

*These data are missing because raw material type and chert color were not recorded for the full collections during reanalysis.

debitage is sufficiently abundant to indicate tool manufacture only in the Woodland component at 41DT62. As tools of these materials are not especially frequent at 41DT62, though, it appears that some of the tools made there were transported off-site for use elsewhere.

Figure 42 shows a clear time-related trend in the usage of lithic materials procured from nonlocal sources. This trend could reflect decreases from the late Archaic period through the Caddoan period in interaction with groups who lived in neighboring regions where high-quality lithics are common (e.g., the Red River valley), or it may indicate the increases in sedentism and reduced residential mobility noted above (i.e., reduced mobility would have led to fewer opportunities for direct procurement). While both factors could well have been involved, reduced mobility probably played a larger role than reduced interaction. This conclusion is based primarily on the ceramic and projectile point data discussed below, which indicate especially vigorous interaction with neighboring regions during the period when nonlocal materials were used least (i.e., the late Caddoan period).

Regardless of the specific mechanisms by which the materials reached Cooper Lake, the nonlocal lithics overall show relatively strong ties to the north or northeast, since 49 percent of the projectile points of these materials are of novaculite or chert that came from the Ouachita Mountains directly or from Red River gravels derived from the Ouachitas (some of these materials, e.g., the novaculite, also could be

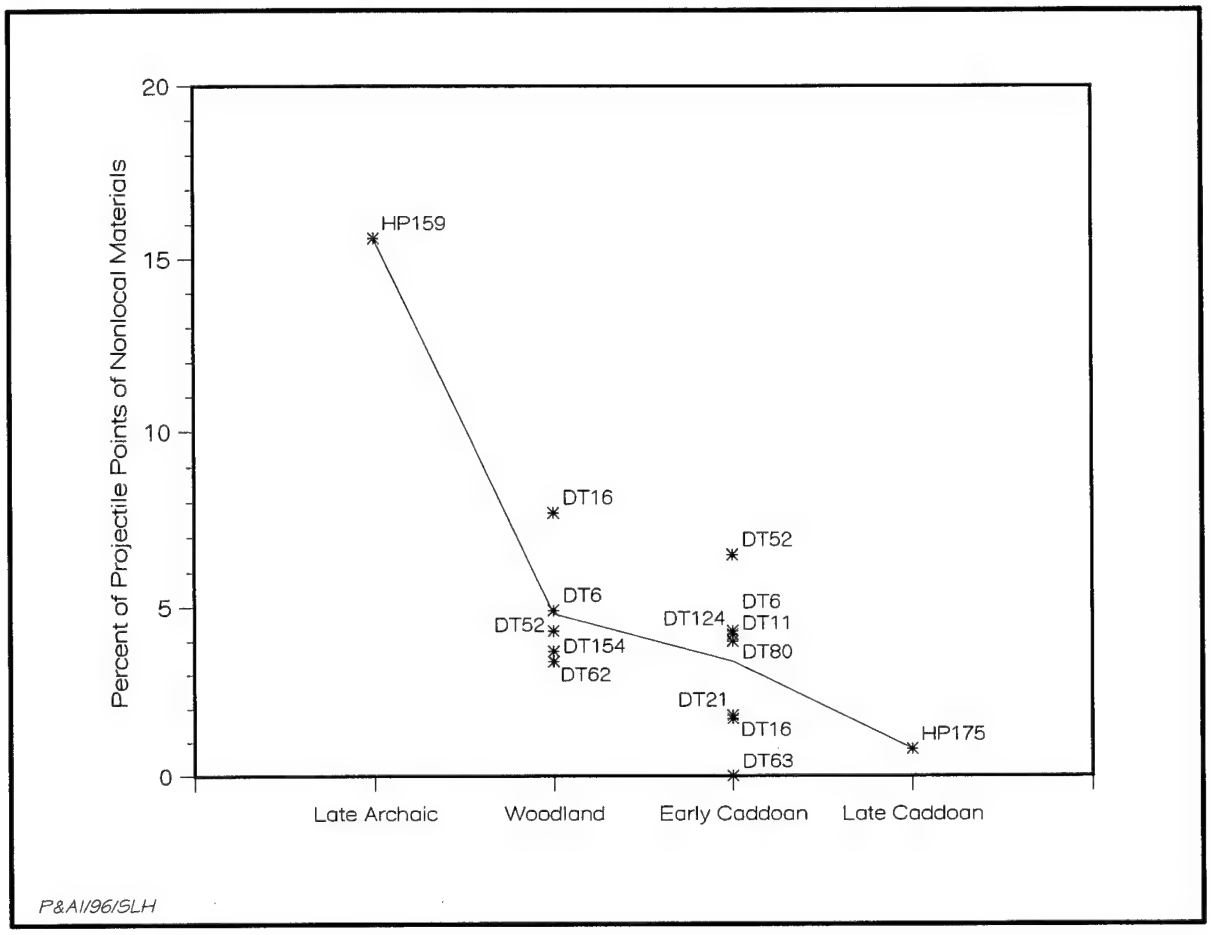


Figure 42. Graph of percentages of chipped stone artifacts of nonlocal materials; the line plots mean values.

from the recently identified, informally named Bowie gravels found on the divide between the Red and Sulphur Rivers in extreme northeast Texas [Cliff, Green, Hunt, Shanabrook, and Peter 1996:7]). Only 10 percent of the points are of central Texas chert, with the remaining 41 percent being of nonlocal cherts from unknown sources. Of course, these data do not say much about contact with groups who lived in areas just to the west, east, or south, as these areas do not contain lithics that are likely to have been imported or that could be distinguished readily from the local Cooper Lake materials.

The projectile point types recovered from the Cooper Lake sites also convey some information about interaction (see Table 4), but the distributional evidence (drawn from Prewitt [1996]) must be used with caution since projectile point styles seldom correlate specifically with social groups. Nonetheless, the fact that many of the most common types (e.g., Gary, Dawson, Kent, and Yarbrough among the dart points, and Alba, Catahoula, Colbert, Friley, and Steiner among the arrow points) occur widely across the eastern third of Texas but not farther west indicates that, at least from the late Archaic period on, there was sufficient interaction among groups who lived in the eastern part of the state to lead to some degree of uniformity in dart and arrow point styles. The only major types that have more-westerly distributions are Perdiz and Scallorn. While both of these could represent increased interaction with groups who lived to the west during parts of the Caddoan period, the case is stronger for Perdiz (i.e., the late Caddoan period) than for Scallorn in view of the heterogeneity evident in this latter type. The only major type to have an especially restricted distribution (to northeast Texas proper) is Turney, but it is doubtful that this style reflects decreased interaction during the late Caddoan period given the distribution of the other major late type (Perdiz) and the variety of ceramics that

characterize this period (see below).

Most of the minor types tend to have easterly distributions that overlap those of the major types; included are Carrollton, Edgewood, Ellis, Morrill, Trinity, Wells, Wesley, and Yantis among the dart points, and Bassett, Bonham, Cliffton, Cuney, Hayes, Minter, Rockwall, and Talco among the arrow points. Some probably represent local versions of these styles, while others may indicate interaction on an intraregional level. Minor dart point types that have different distributions and hence that may represent some form of interregional interaction during the Archaic and Woodland periods include three central Texas styles (Ensor, Marshall, and Williams), with Bell/Calf Creek potentially being a fourth. In contrast, all of the probably nonlocal arrow point styles point northward or eastward (Haskell, Homan, and Keota) or to the west or northwest (Fresno, Huffaker, and Washita). The latter apparently represent interaction between local late Caddoan peoples and Plains groups, while the former probably indicate interaction with early to middle Caddoan groups native to eastern Oklahoma, western Arkansas, northwestern Louisiana, or the Red River valley of northeast Texas.

The ceramics from Cooper Lake provide another line of evidence concerning sociocultural interaction. Although most of the collections are plagued by the problems of small sherd size and limited numbers of decorated sherds, rims, and bases, the overall character of the ceramic assemblages is reasonably clear. The pottery dating to the early part of the Caddoan period shows clear ties to the east and north, based on the predominance of Crockett Curvilinear Incised and a hybrid between this type and Pennington Punctated-Incised among the decorated wares, the consistent occurrence of Williams Plain pottery, and the occasional occurrence of Spiro Engraved and Coles Creek Incised. Notably missing are types that are common on the same time frame in the southern part of the Caddoan region (and reportedly present in the Sulphur River valley downstream from Cooper Lake [T. K. Perttula, personal communication 1995]), such as Holly Fine Engraved and Weches Fingernail Impressed.

The pottery from the single excavated late Caddoan site also indicates strong connections both northward to the Red River and eastward to the Cypress Creek basin, judging from the presence of types such as Avery Engraved, Ripley Engraved, Simms Engraved, Taylor or Wilder Engraved, McKinney Plain, Nash Neck Banded, and Emory Punctated. This late collection also contains sherds representing a few shell-tempered globular jars that are more reminiscent of Plains vessel forms than those found in the Caddoan area, however, and this points to westward or northwestward contacts.

SUMMARY

This section summarizes the information presented above to provide a coherent picture of how prehistoric Native Americans used the upper Sulphur River valley. Regional data from beyond Cooper Lake are discussed where they help set the stage for understanding the archeology of this project area. The discussion below proceeds in chronological fashion from the earliest documented archeological manifestations at Cooper Lake (middle-late Archaic) to the latest (late Caddoan). Because there are no substantial data on earlier (Paleoindian and early Archaic) or later (historic Caddo or immigrant Indians) use by Native Americans, these time periods are not addressed here; the reader is referred to Story (1990), Perttula (1992), and Johnson (1989) for reviews of the archeology of these interesting intervals.

Archaic Period

While Archaic-age artifacts were found at many sites at Cooper Lake, isolable components were excavated at only a single site, 41HP159. The earliest documented occupation at 41HP159 dates to 4450–3250 B.C. and consists of sparse artifact deposits associated with a few rock hearths. The single diagnostic artifact is a Yantis dart point. The remains appear to represent small activity areas reflecting short-term, infrequent use by small groups. Nonetheless, the materials recovered are more suggestive of residential occupations than strictly procurement/processing tasks. Presumably, the site was used by hunter-gatherers, although no subsistence data confirming this were found. The fact that two of the three projectile points are of materials that are nonlocal to the project area suggests that the group who created this component was relatively mobile and had larger territories than later groups at Cooper Lake, although the very small sample size makes this conclusion tenuous.

The later component at 41HP159 dates to 1650–150 B.C. and appears to be similar functionally

to the earlier component, i.e., short-term residential occupations by hunter-gatherers. The greater intensity of use evident for this component compared to the earlier one probably can be attributed to more frequent reoccupation of the site rather than occupations of longer duration. A variety of dart point styles were associated with this component, with Yarbrough, Dawson, Morrill, Trinity, and Wesley probably being relatively diagnostic of the late Archaic period. The lower percentage of projectile points of nonlocal materials may indicate reductions in mobility and territory size from the middle Archaic period, but the value for this late Archaic component is still considerably higher than those for later components in the project area.

There is not much regional information from excavated sites that can be coupled with that from 41HP159 to allow for well-founded reconstructions of Archaic lifeways across eastern Texas as a whole (see Fields and Tomka 1993). Nonetheless, it is clear that the region was used by hunter-gatherers during this time, and it appears that these groups operated largely as foragers, i.e., moving their residential bases frequently to take advantage of temporal and spatial changes in resource availability. Population densities probably were low, especially prior to the late Archaic period, and group territories may have been relatively unconstrained. Large territories and widespread interaction may account for the extensive distributions of the most common dart point types across the eastern part of the state, but there are a few types with restricted distributions suggesting distinct localized interaction spheres in the northern (including Cooper Lake) and southern parts of the region (Fields 1996). This north-south distinction is also evident in the importation of nonlocal lithics, with materials from the north being more common in the western parts of the Sulphur and Sabine basins and central Texas materials being more frequent to the south.

Woodland Period

Components dating to the Woodland period, ca. 200 B.C.–A.D. 800, are present at many sites at Cooper Lake, although they are hard to isolate in some cases because they are not the predominant component and because there are no artifacts that are truly diagnostic of the period. Unlike some other parts of eastern Texas, ceramic technology was not introduced into the upper Sulphur basin during this time, and the most common projectile point styles (Gary and Kent) were ones that had been used earlier as well and that continued to be used during the succeeding early Caddoan period. At some sites (e.g., 41DT62 and 41DT154), the Woodland remains consist of accumulations of lithic artifacts but no features or middens containing subsistence data. Other sites (e.g., 41DT6, 41DT16, and the North Rise at 41HP106) have middens and other features, and one component that dates to this period (the Southwest Rise at 41HP106) has a cemetery with a possibly associated locus of domiciliary features.

The Woodland period saw an increase in the intensity of site use over the Archaic period, and this probably at least partly reflects increased population densities. Occupations of at least moderately long duration are indicated for most, if not all, of the Woodland components at Cooper Lake, and frequent reuse is suggested for several (e.g., 41DT6, 41DT16, and 41HP106). This increased redundancy in the use of certain locales suggests decreased residential mobility. The Cooper Lake sites appear to have been used for broad ranges of procurement, processing, and maintenance activities, but there is no evidence of fully sedentary populations. Subsistence pursuits focused on the hunting of a wide variety of woodland, woodland-edge, and aquatic taxa and on the gathering of wild plant foods. While there is some indication of the use of squash (at 41HP137), there is no evidence for substantial reliance on horticulture. Thus, these Woodland components may be interpreted as hunter-gatherer residential bases. Nonlocal lithic materials are less common than in the Archaic components at 41HP159, and this implies decreased mobility and territory sizes.

From a regional perspective, the Woodland period is interesting archeologically because it immediately preceded the appearance of the Caddoan culture. The origins of the Caddoan culture have been debated for many years, but Story's (1990) synthesis of the archeology of the region suggests that speakers of Caddoan languages occupied the area before the development of a recognizable Caddoan archeological tradition, that the adoption of maize agriculture did not trigger the Caddoan florescence, and that early Caddoan culture was influenced by but did not develop out of Lower Mississippi Valley cultures. Thus, according to Story (1990:293), ". . . there can be little doubt that the emergence of a distinctive southern Caddoan

archeological tradition was basically an in situ development within resident communities of Caddoan speakers." This is supported by Perttula's (1990b) view of the coevolution of cultural systems and cultivated plants in the region. In brief, Perttula (1990b:Part I, 70–97) suggests that there was substantial continuity in subsistence strategies from the late Archaic period through the early half of the Caddoan period, including increased use of domesticated cucurbits, bottle gourds, and native oily seeded and starchy seeded plants such as sumpweed, *Chenopodium*, maygrass, knotweed, and sunflower. While tropical cultigens were introduced during this time and were present across the Caddoan region by ca. A.D. 1000, the development of true agroecological systems, and hence the adoption of vastly different subsistence strategies, did not occur until later, probably after A.D. 1200 (Perttula 1990b:Part I, 97).

The subsistence and settlement data from the Woodland components at Cooper Lake, as well as continuities in dart point styles, are consistent with the idea that the version of the Caddoan culture that became established in the upper Sulphur River basin after A.D. 800 developed among groups who were indigenous to the area. Some support for this conclusion also can be found in the regional evidence, although this is hampered by the scarceness of excavated Woodland sites. In summarizing the information from the Viper Marsh, Mahaffey, A. C. Mackin, Cundleff, and T. M. Sanders sites on or near the Red River to the north and northeast of Cooper Lake, Story (1990:303) notes the following: (1) Woodland occupations were common; (2) a variety of kinds of sites were used, including small short-term camps and larger settlements containing cemeteries; (3) there is no evidence for sedentism, although the larger sites certainly hint at intensive use; (4) there is no evidence for cultigens; and (5) there is no evidence, in the form of constructed mounds or elaborate burials, of the social complexity that is evident in Woodland cultures to the east or that would come to characterize later Caddoan societies. Burnett's (1990) synthesis of the human osteological data suggests that Woodland groups inhabiting the Red River valley were hunter-gatherers, as evidenced by ". . . low caries rates indicating low carbohydrate consumption, low porotic hyperostosis frequency indicating adequate supply of bioavailable iron and high rates of osteoarthritis and osteophytosis indicating high biomechanical stress" (Burnett 1990:414–415). Recent Caddoan isotope data presented by Rose et al. (n.d.) for the Mahaffey site in Choctaw County, Oklahoma ($\delta^{13}C$ values of –20.77 and –21.65) and the Old Martin Place in Little River County, Arkansas ($\delta^{13}C$ values of –21.38, –21.69, –21.70, and –22.14) support the conclusion that the Woodland populations of the Red River valley did not rely on maize horticulture.

To the south and southeast of Cooper Lake in the upper Sabine River and upper Cypress Creek basins, the Woodland period is also poorly understood because isolable components have proven elusive. While noting several problems with the data, Story (1990:309–314) offers the following conclusions based largely on the published data from Lake Fork Reservoir (Bruseth and Perttula 1981; Perttula and Skiles 1988) and Thurmond's (1981, 1985) synthesis of the archeology of the Cypress basin: (1) most of the Woodland occupations appear to date to the late part of the period; (2) settlement density was low compared to the Caddoan period; (3) a variety of kinds of sites were used, including short-term camps and more-intensively occupied small settlements represented by the earliest cultural middens in the area; (4) the limited macrobotanical evidence suggests that hardwood nuts, and probably less likely maize, contributed to the diet; and (5) there are no constructed mounds or elaborate burials reflecting the development of complex ritual or social systems. The small sample of just two human burials from possible Woodland contexts at the Osborn and Tankersley Creek sites (Story 1990:313, 314) prohibits generalizations based on osteological data, but the absence of caries and lack of indications of infections or porotic hyperostosis (Burnett 1990:403–404) are consistent with nonsedentary, hunter-gatherer adaptations.

In the Sulphur River basin downstream from Cooper Lake, Woodland occupations are represented by the materials from the Snipes site at Wright Patman Lake (Jelks 1961; Story 1990:304), by some of the materials at 41CS151 in Cass County (Cliff and Hunt 1995:144–146; Cliff, Green, Hunt, Shanabrook, and Peter 1996:131–161), perhaps by two flexed burials and other materials from the William Farrar site in the middle reaches of the basin, and perhaps by one or more of the burials and other materials from the Bert Davis site (Story 1990:303–304). Because of the little data available, Story (1990:309) limits her conclusions concerning the Woodland period in the Sulphur River basin to noting differences between the lower and upper

parts—with sites in the lower basin having more Williams Plain pottery, greater variety in lithic assemblages, and mortuary practices involving extended interments and ceramic vessels as grave offerings—and suggesting that these differences reflect different social groups, with groups local to the lower basin being more sedentary than those upstream in the Cooper Lake area.

The reported osteological data for this time period in the Sulphur River basin are not very enlightening because the analyzed sample reported by Burnett (1990:400–402) consists of just one individual from the Snipes site and three individuals from a possible Woodland-age burial at the George Preston site just north of Cooper Lake. Nonetheless, the absence of caries at the George Preston site and the lack of evidence for infection at the Preston and Snipes sites are consistent with nonsedentary hunter-gatherer adaptations. As reported in Appendix D, a number of possible Woodland burials were found at Cooper Lake, but the osteological data from them are not enlightening because many were cremations or bundle burials where skeletal remains were poorly preserved, while others cannot be assigned confidently to this period (i.e., they could be early Caddoan). The $\delta^{13}C$ value of –15.0 obtained on the collagen fraction of bones from Burial 15 at the Hurricane Hill site (Perttula 1990a:251) does imply that C_4 plants, possibly including maize, were an important part of the Woodland diet at Cooper Lake, but it is hard to know how to interpret this since no maize has been found in Woodland contexts in the project area.

Overall, it appears that much of northeast Texas was used in a similar manner during the Woodland period. While there may have been some differences between areas, for example, in terms of when ceramic technology was introduced, all of the region appears to have been on a trajectory of increasingly intensive occupation. The Native Americans who lived in the area during this time probably were still chiefly hunter-gatherers, but their stays at some residential campsites were of relatively long duration (perhaps of seasonal length), and they returned to favored locales repeatedly. This may reflect increased population densities, decreased residential mobility, and increasingly localized developments, albeit with a common adaptive strategy. There is no evidence for complex social or ritual systems, as might be indicated by constructed mounds or large cemeteries with abundant grave goods. In fact, the only Woodland burials referenced above that contained offerings, except perhaps the burial with a tubular pipe at the Bert Davis site, the burial with six manos at the Mahaffey site, and three other burials at Mahaffey with single dart points (Story 1990:299–300, 304), were those at the Snipes site, which dates to the late part of the period and is located at Wright Patman Lake in the eastern part of the region. The Woodland peoples who lived in extreme northeast Texas may have been integrated to some extent into the relatively complex societies that developed around the Great Bend of the Red River during the late Woodland period, as represented at the Crenshaw site in southwestern Arkansas, but this certainly was not the case at Cooper Lake and it probably was not true for other parts of western northeast Texas south of the Red River valley.

Early Caddoan Period

The early Caddoan period, ca. A.D. 800–1300, was when Native Americans used the Cooper Lake area most intensively, and many sites in the project area have components dating to this interval. While Gary dart points continued to be used, the bow and arrow was introduced during this time, and certain arrow point styles—especially Colbert, Steiner, and Catahoula, and secondarily Alba, Friley, and Scallorn—are diagnostic of this period. Ceramic technology also reached the upper Sulphur River basin during the early part of the Caddoan period, although pottery apparently was a much less important part of the material culture than during the subsequent late Caddoan period. Almost all of the ceramics are tempered with grog and/or bone, and the predominant decorative techniques used on the relatively infrequent decorated specimens are incising, engraving, and punctating. Most of the more distinctive sherds can be related to the types Crockett Curvilinear Incised, Pennington Punctated-Incised, and Williams Plain.

The excavated early Caddoan sites have middens containing abundant faunal remains, and most have diverse feature assemblages yielding macrobotanical remains. The data indicate an increase in the intensity of site use over the Woodland period, and this probably reflects continued increases in population densities, occupations of relatively long duration, and frequent reuse. This suggests increased redundancy in site use and further decreases in group mobility. The sites were used for broad

ranges of procurement, processing, and maintenance activities, and the possibility of ephemeral structures at several suggests that they may have been used as seasonal campsites. Only one site (41HP106) has yielded concrete evidence for year-round (or maybe multiseasonal) occupations, however.

The macrobotanical remains indicate primary reliance on wild plant foods, with tropical cultigens making modest contributions, and this may be supported by the moderate caries rate presented in Appendix D. On the other hand, substantial consumption of maize is implied by $\delta^{13}C$ values ranging between –15.2 and –17.6 for the collagen fractions of bones from four early to middle Caddoan burials at 41HP106 (see Appendix D). The issue of the dietary importance of maize and other cultigens remains one of the major unanswered questions for the area.

Even higher percentages of the projectile points are of local lithic materials than in the Woodland components, which supports the idea of continued decreases in mobility. Nonetheless, the ceramics and projectile point styles suggest some level of participation in interaction networks that extended across much of eastern Texas, and some of the ceramics point northward into eastern Oklahoma and eastward in southwestern Arkansas and northwestern Louisiana.

From the regional perspective, this period of intensive use of the upper Sulphur River basin can be seen as part of the widespread appearance of the Caddoan cultural complex. As discussed above, there is evidence that these were local developments, albeit with influences from the Lower Mississippi Valley. Because the development of the Caddoan culture was a local phenomenon and the Caddoan area was ecologically diverse, there appears to have been a great deal of cultural variation among early Caddoan groups. Story (1990:323) summarizes this variation by hypothesizing that there were at least four Caddoan subtraditions (i.e., Arkansas Valley, Red River, Woodland Edge, and Piney Woods), and she speculatively places the sites at Cooper Lake, along with those on the Red River to the north and in the upper Sabine and upper Cypress basins to the south and southeast, within the Woodland Edge subtradition. As summarized below, however, the early Caddoan archeology of these areas is notably different from that of Cooper Lake.

It has long been recognized that the Great Bend region of the Red River valley was a focal point of early Caddoan development, as this area contains a number of early Caddoan mound sites with elaborate burials pointing to hierarchical social systems (Schambach 1982a:7). The general picture is one of sedentary agricultural groups inhabiting small farmsteads dispersed around vacant ceremonial centers (Schambach and Early 1982). Because direct data are scarce, however, the importance of cultigens remains a matter of debate. Rose et al. (n.d.) suggest minimal maize consumption during the early Caddoan period, and Perttula (1990b) argues that true agroecological systems did not develop until later. The early Caddoan carbon isotope data cited by Perttula (1990b:Part I, 146) support his contention, as do six $\delta^{13}C$ values averaging –20.5 from the Crenshaw site (Rose et al. n.d.). Just how far up the Red River these cultural patterns extended is not clear, but the burials from the T. M. Sanders site in Lamar County (Krieger 1946), the structural mound and other evidence at the A. C. Mackin site in Lamar County (Mallouf 1976), and the mound and burial evidence at the Dan Holdeman site in Red River County (Perino 1995) suggest at least moderate social complexity for early Caddoan groups not far north of Cooper Lake. The carbon isotope data from three of the individuals in Burial 17 at the Sanders site (with $\delta^{13}C$ values ranging from –10.0 to –12.9) and the high caries rates at Sanders suggest that maize was an important contributor to the diet (Wilson 1993; Wilson and Cargill 1993), but direct subsistence data from this part of the Red River valley are scarce.

Both the upper Sabine River and upper Cypress Creek basins south and southeast of Cooper Lake appear to have seen substantial occupations during the early Caddoan period. While small hamlets and farmsteads were the most common kinds of sites in the upper Sabine basin during this period (Perttula et al. 1986:54–56), Perttula (1994a, 1994b) lists a number of known or potential mound sites, many probably dating to the early and middle parts of the period, along the Sabine River or its tributaries in Rains, Smith, Upshur, Van Zandt, and Wood Counties, indicating the development of hierarchical social and settlement systems. A similar situation appears to have occurred in the upper Cypress basin, as Thurmond (1981:450–454) notes the presence of three early Caddoan mound sites (Hale, Keith, and Garrison) in Titus and Wood Counties and Nelson and Perttula (1993) identify an early Caddoan mound at the Z. V. Davis-McPeek site in northwestern

Upshur County. Macrobotanical data from the Taddlock and Spoonbill sites at Lake Fork Reservoir indicate a reliance on wild plant foods, with tropical and native cultigens being of less importance, although maize occurs more commonly at these sites than at any of the Cooper Lake sites (Perttula 1990b:Part II, 30–44). The analyzed and reported human osteological data for this time period in these areas, consisting of just one individual from the Grimes site at Lake Fork Reservoir and one from the Tigert site in Titus County (Burnett 1990:403–405), are too sparse to be useful.

Turning to the Sulphur River basin, it is difficult to determine how the lower part of the valley was used during the early Caddoan period because so little work has been done there. While five possible mound sites were documented in surveys at Wright Patman Lake (Malone and Briggs 1970:82, 84; Stephenson 1950:6–8), little is known about them, including their ages, and the only two excavated Caddoan sites date to the latter part of the period (Jelks 1961). Nonetheless, the proximity of this part of the basin to the Great Bend of the Red River certainly leads to the expectation that the area was used with some intensity during this interval. Moving upstream, middens implying intensive use during the early to middle parts of the Caddoan period have been documented at 41CS150, 41CS151, and 41CS155/156 in Cass County (Cliff and Hunt 1995:71–74, 144–146, 205–208), but the excavations into these components were not sufficiently extensive to define the nature of the occupations. The most important early Caddoan site in the middle reaches of the Sulphur basin is the T. M. Coles (or Mustang Creek) site in Red River County. This probable burial mound (based on notes on file at the Texas Archeological Research Laboratory) is especially significant to the archeology of Cooper Lake because, while it is ca. 50 km east of the project area, it is the closest known mound site. Perttula (1993: 251) lists two other possible mound sites in this portion of the basin, but their ages, and whether they do in fact contain mounds, remain unknown.

In summary, the broad outline of the development of early Caddoan culture in the Cooper Lake area is similar to that for adjacent areas, but there are notable differences. Groups local to the upper Sulphur basin apparently were more residentially mobile, although there is some evidence for occasional sedentism. Also, the early Caddoan sites at Cooper Lake represent occupations by single, small social groups, and there is no evidence for aggregations of populations into multifamily hamlets or villages. Cultigens contributed to the resource base at Cooper Lake, but they may have been less important than in some other parts of the region. And perhaps most conspicuously, the early Caddoan sites at Cooper Lake exhibit no evidence of the social complexity, as indicated by mound building or elaborate burials, that characterized contemporaneous groups on the Red River, the upper Sabine River, and upper Cypress Creek during this time. Thus, while there is little doubt that the upper Sulphur basin was occupied by groups who can be viewed accurately as Caddoan in some sense, these groups were not as fully integrated into the Caddo culture as were groups in adjacent areas.

Middle to Late Caddoan Period

Evidence for Native American use of the Cooper Lake area during the middle to late parts of the Caddoan period, ca. A.D. 1300–1500, is much sparser, and this appears to reflect an important change in settlement strategies. The only excavated component dating to the first half of this interval is on the South Rise at 41HP106, and it has not been fully isolated since the middle Caddoan artifacts and subsistence remains have not yet been segregated from the early Caddoan ones. Site 41HP175 dates to the latter half of the interval, however, and it shows convincingly that the bow and arrow had replaced the atlatl and dart by this time. Two arrow point styles—Turney and Perdiz—predominate at 41HP175 and are diagnostic of the period. Pottery is much more frequent in this late context than in the early Caddoan components, indicating that ceramic vessels played a more important role in the material culture. While some continuities in ceramic technology are evident, the late pottery stands out in that shell replaced bone as the second most common tempering agent (with grog still predominating), and a wider range of vessel forms was manufactured. Also, a somewhat higher percentage of the pottery was decorated than during the early Caddoan period, and the techniques of engraving, appliquéing, neck-banding, and brushing increased in frequency at the expense of incising. The late ceramics also can be related to a wider variety of types, including Ripley Engraved, Avery Engraved, Taylor/Wilder Engraved, Simms Engraved, Nash Neck Banded, McKinney Plain, and Emory Punctated, with a few other

vessels being untypeable but clearly related to Plains rather than Caddoan forms.

Both of the analyzed middle to late Caddoan components appear to have seen long-lived occupations involving broad ranges of activities, and at least one, and probably both, were used by sedentary groups. Thus, limited residential mobility is indicated, and these sites probably were similar functionally, i.e., small farmsteads occupied by groups with mixed hunter-gatherer and horticultural economies. There is no evidence for substantially greater reliance on cultigens than during the early part of the period, and there is no indication of a shift to a bison-oriented hunting strategy.

The small number of isolable components dating to this late interval makes it clear that this stretch of the Sulphur River valley was occupied less densely during this time than before. In fact, small numbers of late artifacts occur at many sites that predominantly predate ca. A.D. 1300, and because of their small numbers these artifacts suggest that most of the late components in the project area represent nonintensive, presumably limited purpose use. Thus, there is reason to question whether the two excavated components are typical for the area, and it appears that settlement systems during the latter half of the Caddoan period may have entailed limited numbers of residential sites but relatively large numbers of limited-function procurement/processing sites. This implies an increase in logistical mobility over the early Caddoan period, but this is not reflected in the lithic raw materials at 41HP175, where nonlocal lithics are exceedingly scarce. Thus, it appears that increases in logistical mobility were not accompanied by increases in territory size. The ceramics and projectile point styles at 41HP175 suggest substantial interaction with Caddoan groups who lived on the Red River to the north and in the Cypress Creek basin to the southeast, and interaction with Plains groups to the west or northwest is suggested by the few non-Caddoan vessel forms and perhaps by the single bison rib rasp.

The changes in middle to late Caddoan settlement strategies at Cooper Lake certainly were related to changes in land-use strategies on a regional scale. Story (1990:322, 327), emphasizing the importance of group movements within the Caddoan area, suggests that the scarcity of late sites at Cooper Lake reflects shifts associated with the formation of the two Caddoan population concentrations, one around the Great Bend of the Red River and the other in the Neches-Angelina basin, that were observed historically. Perttula's (1990b:Part I, 97, 172) synthesis proposes that this period saw the development of a specialized subsistence strategy with an increased emphasis on tropical cultigens, more-restricted use of native cultigens, and decreased emphasis on wild plant foods, especially hardwood nuts. He also suggests that late Caddoan adaptive strategies in the western Arkansas River basin and perhaps elsewhere along the western margin of the Caddoan area were affected by climatic changes, with the establishment of drier and cooler conditions after ca. A.D. 1200 leading to increased use of bison (in the Arkansas basin) and other prairie resources and decreasing the feasibility of maize agriculture (Perttula 1990b:Part I, 112–122).

Judging from both the historic accounts and the archeological evidence, it is clear that the Great Bend of the Red River was occupied intensively during the late Caddoan period. Settlement systems consisting of dispersed farmsteads and vacant ceremonial centers seem to have prevailed throughout the period here (Schambach 1982a:7–10), and the occurrence of mound centers and elaborate burials indicates structured, hierarchical social systems. The picture of a sedentary population following an agricultural lifeway is supported by the macrobotanical evidence from the Cedar Grove site, where maize was widespread but not abundant (Trubowitz 1984:207–210), and by the generally high caries rates and high carbon isotope values summarized by Harmon and Rose (1989:345, 348). Based on the occurrence of middle to late Caddoan mounds or elaborate burials at sites such as Sam Kaufman-Bob Williams-Roden, Wright Plantation, Dan Holdeman, and Rowland Clark in and just north of Red River County (Bruseth et al. 1991, 1992; Perino 1981, 1983, 1994, 1995; Skinner et al. 1969), it is clear that Caddoan complexes at least partly comparable to those of the Great Bend area extended well westward to within ca. 80 km of Cooper Lake. The subsistence data from several of these sites indicate hunting strategies focusing on deer, small mammals, and fish, with little evidence for use of bison, while both wild plant foods and tropical cultigens were important (Blake 1994; Perttula 1990b:Part I, 112–122, Part II, 87–96; Story 1990:342–343). The conclusion that maize contributed substantially to the diet is supported by the high caries rates for the burials from Sam Kaufman-Bob Williams-Roden (Burnett 1990:394–395), as well as 11 $\delta^{13}C$ values

(on collagen fractions) ranging from –11.5 to –17.0 from Rowland Clark, Holdeman, and Roden (T. K. Perttula, personal communication 1996), and it appears that the groups who inhabited this stretch of the Red River valley were settled agriculturalists.

In the upper Sabine and Cypress basins south and southeast of Cooper Lake, late Caddoan residential sites apparently are common but mound sites are rare or absent (Bruseth and Perttula 1981:142-143; Perttula 1994a:12; Perttula et al. 1986:56–58; Perttula et al. 1993; Thurmond 1981:451, 1985:195). This implies that social systems were less complex than in late Caddoan societies on the Red River to the east and north (Story 1990:340), and Thurmond (1988:3) suggests that this reflects an essentially egalitarian society with few individuals of elevated rank. Nonetheless, a number of large cemeteries dating to this interval are known in the Cypress Creek basin (Turner 1978, 1992), along with a single related cemetery in the upper White Oak Creek basin in Hopkins County (Scurlock 1962), and it is clear that the Cypress Creek and Sabine River valleys supported sizable sedentary populations. The meager subsistence and osteological data reported are not very conclusive about the importance of agriculture in these areas, but the best reported sample of macrobotanical remains, from the Steck site, contains maize from numerous contexts (Perttula 1990b:Part II, 49–50).

As for earlier time periods, relatively little is known about late Caddoan use of the lower Sulphur River basin because it has seen little work. Two of the three excavated sites at Wright Patman Lake contained late Caddoan components, however, and both appear to represent small farmsteads or hamlets (Jelks 1961:36, 65). Based on proximity to the Great Bend of the Red River, it seems likely that this area was occupied by sedentary agriculturalists during this interval. This is supported by the data from 41MX5, a small late Caddoan hamlet in Morris County which contained evidence of perhaps two domiciliary structures associated with burials and which yielded small quantities of maize and squash (Brewington et al. 1995). The only burial at 41MX5 with preserved skeletal remains contained an individual with a high caries rate, supporting the idea that carbohydrates were important to the diet, but it is risky to draw conclusions about the importance of maize based on this small sample. Recent work at the White Oak Creek Mitigation Area in Bowie, Cass, and Morris Counties (Cliff 1994:197; Cliff and Hunt 1995:145, 206) has identified a few sites with late Caddoan components (e.g., 41CS151 and 41CS155/156), but these do not seem to represent intensive occupations, and most may reflect use for procurement/processing purposes rather than domiciliary activities.

In sum, the Cooper Lake area saw relatively limited use during the middle to late Caddoan period and apparently was abandoned after about A.D. 1500. The excavated Cooper Lake sites that do date to this interval reflect more sedentary occupations than during the preceding period, but there is no evidence for substantial changes in subsistence (i.e., an increase in the importance of agriculture). The subsistence evidence, the fact that sites continued to be occupied by single small social groups, the lack of mounds, and the lack of elaborate mortuary behavior (i.e., structured cemeteries with abundant grave goods) all indicate continuity with the early Caddoan period, and hence it is reasonable to suppose that the area was used during this late interval by descendants of the same groups who had lived there previously. As for the early Caddoan period, late Caddoan groups at Cooper Lake, while certainly interacting fairly intensively with other groups to the north and east (and probably south), were not as fully intregrated into the Caddo culture as were these other groups.

The obvious question is, "Why was the Caddoan culture less fully developed among groups who lived in the upper Sulphur basin than among their neighbors on the Red River to the north and in the Sabine and upper Cypress basins to the south and southeast?" Geographically, Cooper Lake lies right between and not far from these areas (it is only ca. 60 km to both the Red and Sabine Rivers), and thus it is difficult to see Cooper Lake's peripheral location relative to the Caddo heartland as a fully satisfactory explanation for its differences. Another explanation that might be invoked, that the Cooper Lake area was less suited to aboriginal agriculture because of the clayey sediments of the Blackland Prairie, probably can be discarded outright for at least two reasons. First, it is clear that the Caddoan groups at Cooper Lake practiced horticulture to some extent, in spite of the sediments. And second, there is a growing body of evidence indicating that the rise of the Caddoan culture was not a phenomenon born out of the development of an agricultural economy. Cultigens certainly contributed to early Caddoan subsistence, but it was not until the latter

half of the period that agriculture became the focus of subsistence pursuits.

Perhaps another approach for explaining this intraregional variability deals more with the persistence of long-standing patterns. For instance, a recent review of the archeology of the post oak savannah of east-central Texas suggests that some of the variability seen in that area during the Caddoan period had its roots much earlier in the Archaic period (Fields 1996). From this perspective, the explanation for why the Cooper Lake Caddo were different may lie in the overlap between persistent local variations on a common adaptive strategy, differences in interaction spheres, variability in the acceptance of new technologies and subsistence practices, and differences in the acceptance of new ideologies among groups who had occupied the woodlands of eastern Texas for millenia. Unraveling this complex issue will not be easy, but the key to doing it successfully—thoughtful and critical comparative studies of regions and the relationships between regions—is clear enough.

THE HISTORIC RESOURCES

4

OVERVIEW

While historic components were documented in the course of investigating some prehistoric sites during the early years of archeological work at Cooper Lake, it was not until work resumed in 1986 that historical resources were examined in a systematic manner. Of the 180 historic sites recorded in the project area, 153 are known exclusively from survey level information, consisting mostly of field location and mapping. Complete archival and informant research was not conducted for these sites, and the limited work of this type that was done was sporadic. Because these sites yielded little information that is useful to examining historic use of the Cooper Lake area, they are not discussed further here. In addition, two cemeteries, 41DT102 (Dawson) and 41DT259 (Liberty Grove), were relocated without benefit of archeological or archival/informant investigation, and they are omitted from the discussion below.

Of the remaining 25 sites, 3 are cemeteries for which limited archival/informant and/or archeological research was done in conjunction with relocation, 18 are farmsteads that were subjected to testing-level work, and 4 are farmsteads that were investigated at the data recovery level (Table 13). The utility of the data from these 25 sites varies widely, however. For example, when the Tucker Cemetery (41DT104) was relocated, archeological investigations and archival/informant research were conducted, but the needs of the archeologists were not accommodated to such an extent that significant data could be recovered from the interments. As Lebo (1988:29) explains, "Because the relocation phase was not designed and conducted as an archaeological project, the recovery and removal of the burials was the direct concern, and the archaeological and bioarchaeological tasks were secondary." Archival and informant research accompanied the relocation of the Friendship Cemetery (41DT180), but archeological work did not accompany the disinterments. Hence, this cemetery/church/school complex associated with the African American Friendship community was not studied to the extent that it contributed substantial knowledge of the internal social dynamics of that settlement.

Some of the tested sites are of limited utility because little archeological work was done in the historic components (e.g., 41DT120, 41DT124, and 41DT181), because the work that was done was incidental to investigation of the prehistoric components and thus not focused on discovering details of the historic occupations (e.g., 41DT59, 41DT124, and 41HP106), or because insufficient archival and informant research was done to answer questions about who was associated with the sites (e.g., 41DT59, 41DT119, 41DT181, and 41HP153). Site 41HP142 yielded a useful collection of artifacts. However, the materials are from the surface with little or no subsurface deposits present and hence are of low contextual integrity. Therefore, this site is not well suited to answering questions about the spatial layout of a farmstead. Sites 41DT121 and 41HP143 also provided potentially informative assemblages of artifacts, but not enough investigation was done to clarify contradictions between the archival, informant, and archeological evidence. Although much is known archivally about 41DT107, the small amount of testing conducted indicates only a short-term occupation that has been impacted by modern disturbances. Finally, at some sites, particularly 41DT88, 41DT91, 41DT120, 41HP152, and 41HP158, the remains were too recent to be of

TABLE 13

TESTED AND MITIGATED HISTORIC SITES

Site	Site Type	Kind and Amount of Work	Type of Occupancy	Known Owner(s)	Ethnicity	Community	Date Range
41DT59	probable farmstead	26 0.5-x-0.5-m units, 2 1-x-1-m units	unknown	unknown	Anglo-American*	unknown	ca. 1920–1940
41DT88	farmstead	30 shovel tests, 9 0.5-x-0.5-m units, archival and informant research	owner/ tenant	J. E. or Emmet Grant	Anglo-American*	Cedar Creek	ca. 1915–1960
41DT91	farmstead	27 shovel tests, 4 0.5-x-0.5-m units, 2 1-x-1-m units, 5 backhoe trenches, archival and informant research	owner/ tenant	W. Tharp or Faulkner	Anglo-American*	Cedar Creek	ca. 1880–1930
41DT97 James Franks	farmstead	42 shovel tests, 142 1-x-1-m units, 2 backhoe trenches, ca. 570 m^2 scraped, magnetometer and electrical resistivity survey; archival and informant research	owner	James Franks	Anglo-American	Cedar Creek	ca. 1852–1857
41DT104 Tucker Cemetery	family cemetery	relocation; archival and informant research	–	–	Anglo- and Native American	Cedar Creek	ca. 1880–1942
41DT105 Sinclair Cemetery	cemetery	relocation; archival and informant research	–	–	Anglo- and Native American (?)	Granny's Neck/Pecan Grove	ca. 1850–1880
41DT107 John T. Talley Homestead	farmstead	12 0.5-x-0.5-m units, archival and informant research	owner	John T. Talley	Anglo-American	Granny's Neck/Pecan Grove	ca. 1888–1940
41DT113 John C. Wright	farmstead	112 0.5-x-0.5-m units, archival research	owner	John C. Wright	Anglo-American*	Cedar Creek	ca. 1853–1856
41DT118 Zephriah Dawson	farmstead	20 shovel tests, 188 0.5-x-0.5-m units, 2 backhoe trenches, 2 hand trenches, archival research	owner	Zephriah Dawson	Anglo-American	Cedar Creek	ca. 1850–1880

*Ethnicity is implied from the literature but not explicitly identified.

Table 13, continued

Site	Site Type	Kind and Amount of Work	Type of Occupancy	Known Owner(s)	Ethnicity	Community	Date Range
41DT119	farmstead	19 0.5-x-0.5-m units	unknown	Quinton Miller (?)	Anglo-American*	Cedar Creek	late 19th-mid 20th centuries
41DT120 Carl V. Dawson Farmstead	farmstead	2 0.5-x-0.5-m units, archival research	owner	Carl V. Dawson	Anglo-American*	Cedar Creek	ca. 1925–1945
41DT121 John B. Talley Homestead	farmstead	13 0.5-x-0.5-m units, archival and informant research	owner/ tenant	John B. Talley	Anglo-American	Granny's Neck/Pecan Grove	ca. 1880–1940
41DT124 Doctors Creek	farmstead	3 0.5-x-0.5-m units	owner	H. A. Gannon	Anglo-American*	Granny's Neck/Pecan Grove	ca. 1950
41DT126 Robert Hannah	farmstead	20 shovel tests, 118 0.5-x-0.5-m units, ca. 400 m^2 scraped, 4 backhoe trenches, archival and informant research	owner/ tenant	Robert Hannah	Anglo-American	Granny's Neck/Pecan Grove	ca. 1840–1920s
41DT180 Friendship Cemetery/ Church/School	cemetery	relocation; archival and informant research	–	–	African and Native American(?)	Friendship	1880–1976
41DT181	farmstead	2 0.5-x-0.5-m units	unknown	unknown	Anglo-American*	Klondike**	20th century
41DT192 John Derrick Farmstead	farmstead, sorghum mill, store, restaurant	2 shovel tests, 20 0.5-x-0.5-m units, 7 backhoe trenches, archival and informant research	owner	John Derrick	African American	Friendship	ca. 1897–1956

**Possible community of association

Table 13, continued

Site	Site Type	Kind and Amount of Work	Type of Occupancy	Known Owner(s)	Ethnicity	Community	Date Range
41DT208 John Hancock Farmstead	farmstead	18 shovel tests, 52 0.5-x-0.5-m units, 6 backhoe trenches, archival and informant research	owner	John Hancock	African American	Friendship	ca. 1889–1920s
41DT249 Wallace Carter Farmstead	farmstead	41 0.5-x-0.5-m units, 3 backhoe trenches, archival and informant research	owner	Blandon/Carter	African American	Friendship	1917–1958
41HP106 Hurricane Hill	farmstead	39 shovel tests, 4 0.5-x-0.5-m units, 7 1-x-1-m units, archival and informant research	owner	A. W. Withrow	Anglo-American*	Addran	ca. 1860–1940
41HP142	farmstead	complete surface collection, 10 shovel tests, archival and informant research	tenant	unknown	Anglo-American*	Addran	ca. 1870s–1880s
41HP143 Lodwig Vaden	farmstead	surface collection, 23 shovel tests, 8 0.5-x-0.5-m units, archival and informant research	owner	Lodwig Vaden	Anglo-American	Addran	ca. 1870–1940
41HP152	farmstead	43 0.5-x-0.5-m units, archival and informant research	owner/ tenant	George W. Harper	Anglo-American*	Addran	ca. 1840–1940
41HP153	probable farmstead	15 0.5-x-0.5-m units	owner	H. G. Weir	Anglo-American*	Addran	ca. 1890–1940
41HP158	farmstead	17 0.5-x-0.5-m units, archival and informant research	owner/ tenant	Cockrum Putnam	Anglo-American*	Peerless**	ca. 1912–1950s

interest archeologically or the integrity of the earlier components had been compromised by subsequent activity. As a result, the investigators recommended that the sites were not worthy of more extensive archival, informant, or archeological research.

The best data on historic use of the Cooper Lake area come from seven farmsteads—James Franks (41DT97), John C. Wright (41DT113), Zephriah Dawson (41DT118), Robert Hannah (41DT126), John Derrick (41DT192), John Hancock (41DT208), and Wallace Carter (41DT249)—and from the Sinclair Cemetery (41DT105) (Figure 43). These are discussed below under four headings. The first consists of three farmsteads (41DT192, 41DT208, and 41DT249) that were associated with the African American community of Friendship and that were tested by Geo-Marine in 1994. The second consists of 41DT105, the sole cemetery that was investigated intensively. The third consists of three farmsteads (41DT113, 41DT118, and 41DT126) where Southern Methodist University conducted data recovery excavations in 1987. And the fourth consists of 41DT97, a farmstead that saw extensive excavations by the University of North Texas in 1986 and 1987.

THE FRIENDSHIP COMMUNITY: 41DT192, 41DT208, AND 41DT249

All of the tested sites under consideration here were included under the scope of one study of the African American community of Friendship. Three farmsteads were examined: 41DT192 (John Derrick, ca. 1897–1956), which also included a sorghum mill, store, and restaurant; 41DT208 (John Hancock, ca. 1889–1920s); and 41DT249 (Wallace Carter, ca. 1917–1958). As individual entities, these sites offer limited information. Taken together, however, they provide a more holistic and valuable portrait of life within Friendship and its relation to the nearby Anglo-American community of Klondike. Site 41DT208 represents Friendship during its earlier period at the height of its success and social cohesion, whereas 41DT192 and 41DT249 date to a time when the community was declining.

The initial survey-level investigations at these sites were conducted by Southern Methodist University (Jurney et al. 1993). At that time, limited archival, informant, and archeological research were accomplished. Based on those results, 41DT192 and 41DT208 were recommended for further work because of their potential for unique data, but 41DT249 was assessed as not needing further study due to its recent occupation and the degree of disturbance. However, upon reassessment of the research designs put forward for the Cooper Lake area (Fields and Gardner 1991; Moir and Jurney 1988), this site later was included within the scope of the community study.

In 1994, Geo-Marine conducted "an intensive archival and oral history review, coupled with limited archaeological investigations, of the small post-Reconstruction era African-American community of Friendship located on the Prairie Margin of Northeast Texas" (Green et al. 1996:xi). A degree of continuity was maintained from the original survey recording of the sites in that Geo-Marine interviewed the same informants: Jeff Blandon, Zephry Mae Walker, and Jack Anderson. This study served to fill an important void in the historic data base for the Cooper Lake area. Up to that point, no comprehensive community studies had been conducted, nor had any specific attention been paid to the African American contribution to the history of the area.

Among the more interesting and informative aspects of this study were the parallel histories of Friendship, an African American community, and Klondike, an Anglo-American community. The authors believed that this was an excellent example of co-existence of the two different racial groups. They state that "Friendship can be considered a community although it lacked any real commercial endeavors within its boundaries" (Green et al. 1996:45). As a result, Friendship relied on the commercial establishments in Klondike to provide those needs, such as stores, blacksmith, railroad depot, cotton gin, etc., thus creating a bond between the separate settlements. The authors also point out that "the willingness to sell property to ex-slaves may reflect a more lenient attitude toward African-Americans by the early Upland South settlers and their descendants" (Green et al. 1996:36). The main emphasis in this historical narrative is on peaceful interaction.

However, it is clear that there was an underlying hint of tension that should not be forgotten within the larger scope of race relations. The authors' specific focus when looking at the development of Friendship was framed within the concept of acculturation, i.e., the "processes and results of former slaves adapting into the dominant white culture in

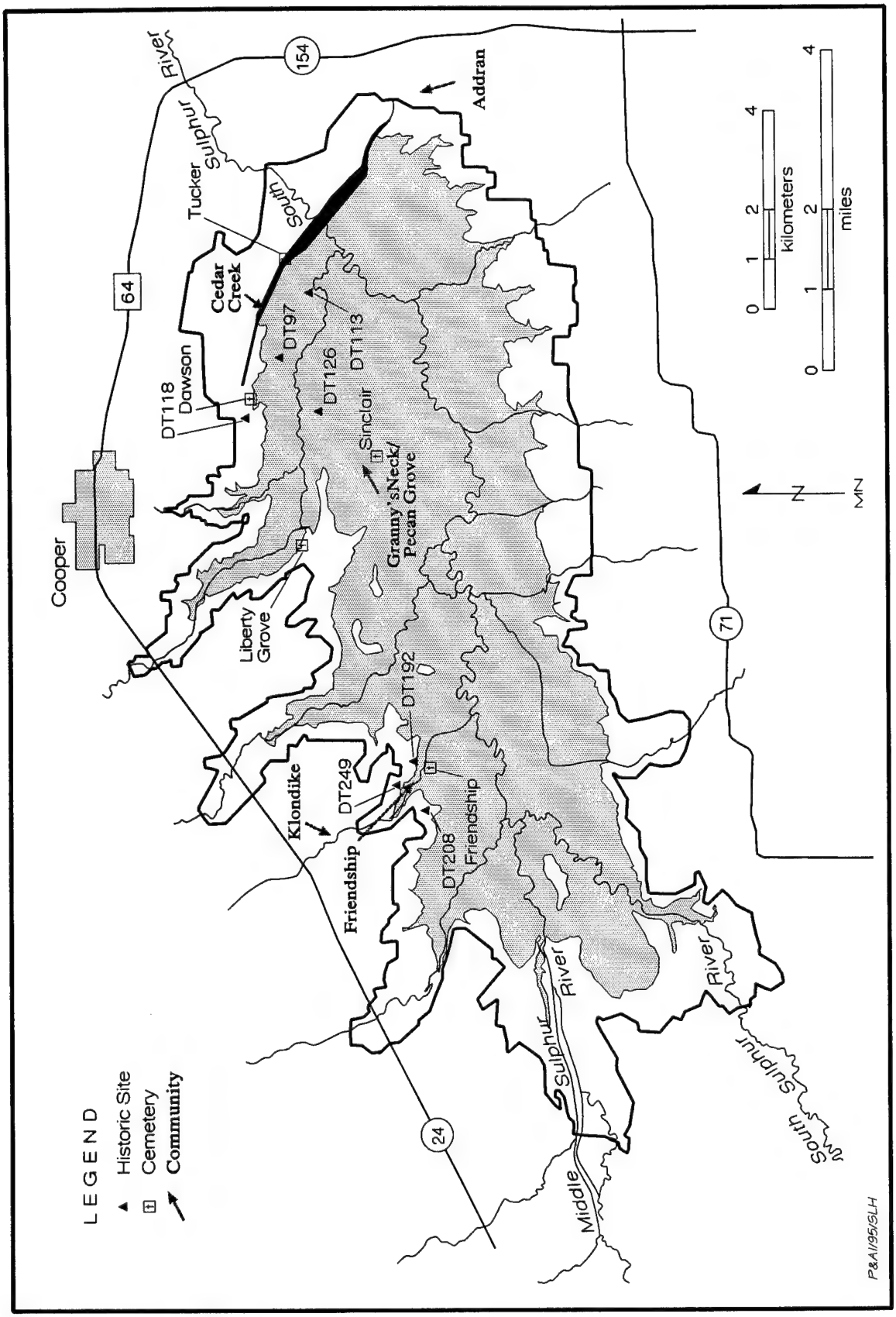


Figure 43. Map of Cooper Lake area showing selected historic sites and communities.

order to survive the stresses experienced after freedom," and the authors themselves describe Klondike as a "white-controlled town" (Green et al. 1996:27). The larger context of history must be remembered as well. Although this study focused on a specific locality, the authors set it within the general scope of the Southern, post-Reconstruction, tenant farming system (although there were several African American landowners in Friendship), which eventually collapsed due to out-migration.

It seems that the authors' assessment of peaceful relations was accurate at one level, but only when considered within accommodationist attitudes. Friendship/Klondike was not without racism. For example, Klondike supported "the Park Brothers Restaurant, which did not allow African-Americans to eat with Euro-Americans, [and] was the only reported open occurrence of open segregation in Klondike" (Green et al. 1996:32). Of course, segregation also was evident in that the two communities were separate.

41DT192, John Derrick Farmstead

This site, which dates ca. 1902–1956, is south of the original location of the Free Hope Baptist Church and approximately 200 m north of Honey Creek. It is situated on an upland pasture, which originally would have been a post oak savannah setting. It was cleared historically for cultivation and is now populated with grasses and bois d'arc and other trees, which survive just above the water line of Cooper Lake. The soil type is Normangee clay loam (Jurney et al. 1993; Green et al. 1996).

The initial survey was done in 1989. Informant interviews indicated that African American John Derrick had occupied the site and operated a sorghum mill, store, and cafe. As a result of that work, 41DT192 was recommended for further investigation since it was "unique for the project area and can provide information on the socioeconomic status of rural ethnic groups. Rural cottage industry sites are poorly documented in this area" (Jurney et al. 1993:8-134 through 8-135).

One of the most important components of Geo-Marine's 1994 testing program was the development of a complete site history derived from intensive and systematic archival research. The original 1867 Robert Carson Survey was split several times and passed through many hands, including the approximately 50 acres that John Derrick bought from Benjamin Graham in 1897. By 1902, Derrick had paid off his promissory notes to the Freehold Land Mortgage Company, giving him clear ownership of the land. In 1921, Derrick used that land as collateral for a loan, which he subsequently was unable to repay. Informants speculated that Derrick took out the loan to finance either the sorghum mill operation or his wife Rosa's cafe. Derrick continued to reside on the property until his death in 1956, despite the fact that the land had been sold (Green et al. 1996).

The subsurface testing consisted of excavating two shovel tests, twenty 0.5-x-0.5-m units, and seven backhoe trenches (Figure 44). These were distributed across the site in an effort to explore possible features indicated by the archival, informant, and survey information.

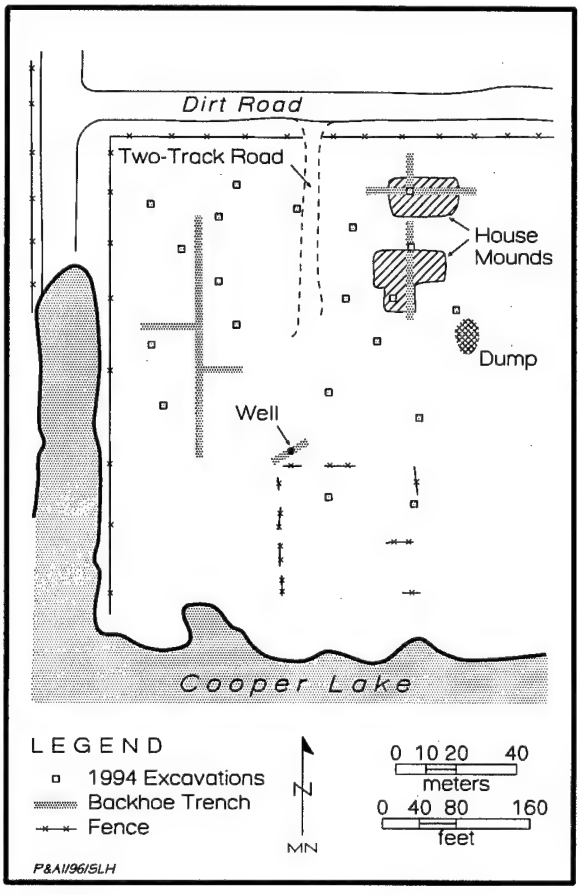


Figure 44. Plan of 41DT192 showing surface features and 1994 excavations.

Features were encountered both on the surface and in subsurface testing. "Features observed during this phase of work included the brick well, two house mounds, a large concentration of bottles and

jars southwest of the large house mound, and remnants of the corral" (Green et al. 1996:80). The bricks that had been observed during the original recording and that were suspected to be part of the sorghum mill unfortunately had been removed by the time of the Geo-Marine project. Within the excavations themselves, one feature was located. That feature, discussed in detail within the report and designated as Feature 2, was described as

> a large concentration . . . of stacked, broken (and slightly burned or scorched) ceramics and kitchen utensils [that] was uncovered at the edge of the house mound. It was covered with a large piece of thin metal that may have been the top or part of a cupboard or large box used to store the china and utensils that were used at the cafe [Green et al. 1996:84].

Feature 1, though not specifically indicated as such, was apparently the jar/bottle concentration which yielded products from companies including the Hazel-Atlas Glass Co. (1920–1964), Illinois Glass Co. (1873–1929), Knox Glass Bottle Co. of Mississippi (1932–1953), and Owens-Illinois Glass Co. (1929–1966) (Green et al. 1996:89).

A total of 1,171 artifacts was recovered from the excavations in the following amounts: Domestic/ furnishings, n = 218; Architecture, n = 122; Personal, n = 13; Activities, n = 38; and Indeterminate, n = 780. The large frequency of items in the Indeterminate class can be attributed to a fire at the Derrick house, which melted artifacts into indistinguishable forms.

Two of the more interesting personal artifacts are James W. Derrick's (John's son) World War I dog tag and a store token for C. P. Hollon's establishment in the nearby town of Klondike. Of the diagnostic artifacts, 82 ceramic sherds were recovered, including 48 whiteware sherds (post-1880), 5 porcelain sherds, and 11 refined earthenwares unidentifiable due to burning. Makers' marks were identified from three different potteries: Taylor, Smith, and Taylor of Chester, West Virginia, dated 1938–1950s; W. S. George Pottery Company of East Palestine, Ohio, dated from the late 1930s to the 1940s; and Gladding, McBean and Company in Glendale and Los Angeles, California, dated between February 1939 and August 1940 (Green et al. 1996:93). Of the 18 stoneware examples recovered, a Bristol-slipped sherd (post-1900) bears a mark identifying it as being from the Macomb Pottery of Macomb, Illinois.

At the completion of work at 41DT192, researchers with Geo-Marine concluded that the Derrick house had burned in place leaving a large number of artifacts dating to the early to mid twentieth century. The presence of a cafe in one portion of the house might have provided an unusually large assemblage of ceramics and bottles, although they did serve as a good example of the types of products that would have been available to an African American community in northeast Texas at the beginning of this century. However, no archeological evidence was recovered to support the presence of the reported sorghum mill.

41DT208, John Hancock Farmstead

The John Hancock family resided at 41DT208 from the late 1880s until the early 1920s. It is located approximately 1 km west of Honey Creek and ca. 1.7 km north of the South Sulphur River in an upland setting (Jurney et al. 1993:8-157). Ornamental plants on the site consist of irises and yuccas, with the rest of the vegetation being grasses and a variety of trees (e.g., bois d'arc, oak, and pecan). The soil is mapped as Crockett loam (Green et al. 1996:99).

Eighteen shovel tests were excavated and a map was produced when the site was first recorded in 1989. At that time, it was theorized that

> It is possible that this is a short-term occupation dating ca. 1880 to the early 1930s. The material culture and spatial distributions of temporally diagnostic artifacts indicate a structural deposit that has potential to yield behaviorally meaningful information relevant to the material culture and settlement research questions outlined in the Research Design [Jurney et al. 1993:8-158].

Also, informant research revealed that this was the original site of the sorghum press that was later moved to 41DT192, making it a potentially important connection between this farmstead and Derrick's.

As with all farmsteads in this area, the deed history for Hancock's land was long and complex. Ultimately in 1889, John Hancock bought a "16.106 acre tract in the Kimble Survey and one land tract in the J. B. Hooten Survey" from Joe B. Blandon

(Green et al. 1996:101). Hancock rented additional land for cotton production. He was also a preacher and one of the trustees of the Colored Methodist Episcopal Church.

Subsequent testing by Geo-Marine consisted of fifty-two 0.5-x-0.5-m test pits and 6 backhoe trenches (Figure 45). Units were excavated in an area believed to be the original house site, guided by the presence of ornamental plants (yuccas and irises). These units yielded few artifacts. Most of the units elsewhere on the site also offered little, although units placed to the north and west of the proposed house area recovered many more artifacts, especially domestic materials.

Backhoe trenches were employed in an effort to further explore features evident on the surface. Trench 1, in the northwestern part of the site, was excavated adjacent to a large depression that had been identified as a barn by an informant. Trenches 2 and 3 in the central part of the site were dug to provide profiles for comparison to those dug in the domestic areas. Trenches 4 and 5 were excavated in the same area as test pits at the supposed house location near the eastern edge of the site. None of these trenches yielded cultural features, and it was hypothesized that, since no structural features were

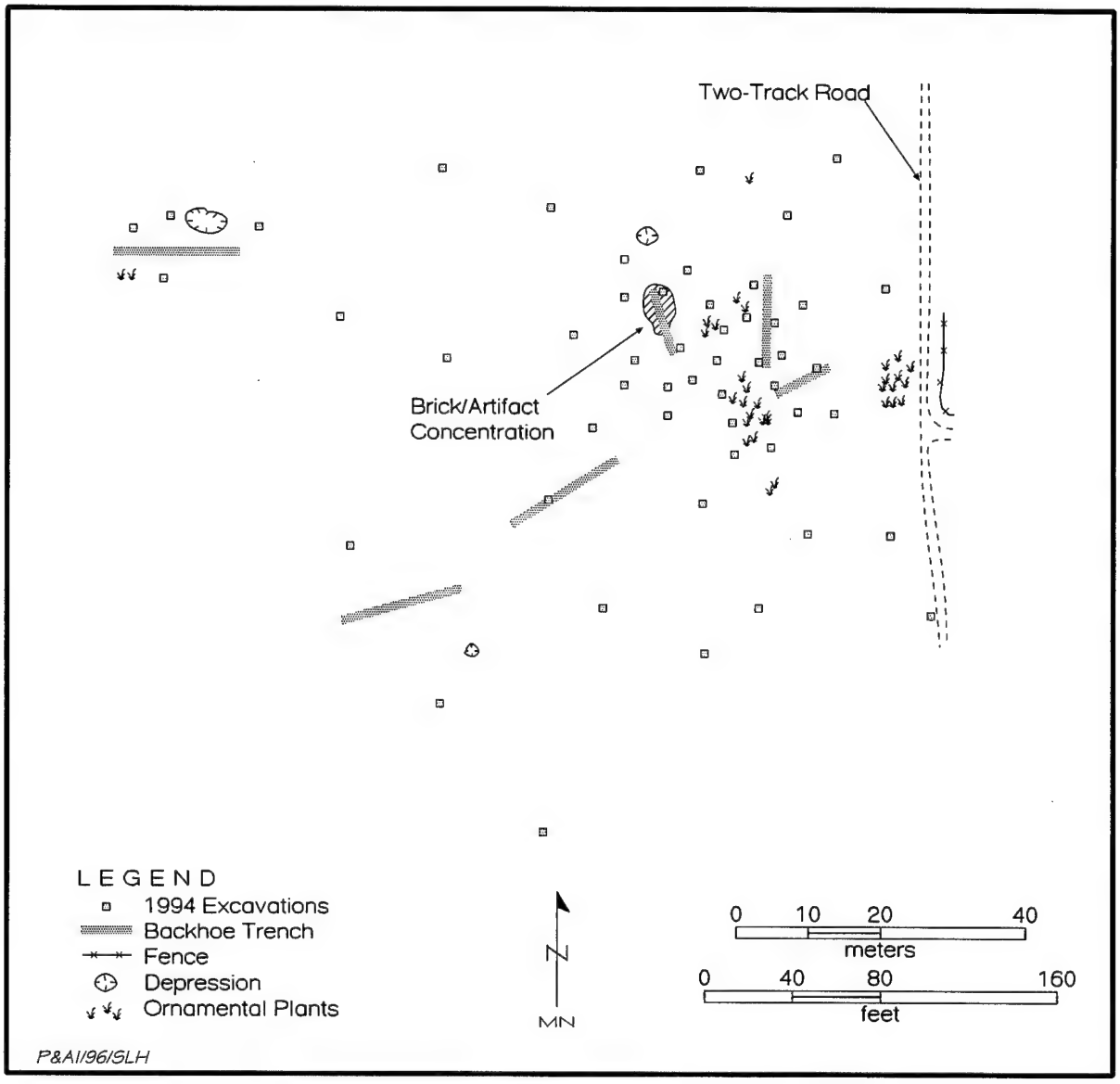


Figure 45. Plan of 41DT208 showing surface features and 1994 excavations.

encountered, the house most probably stood on piers.

Trench 6 was a cut through a brick rubble and artifact concentration (Feature 1), which gave way to a charcoal deposit, which in turn overlay an ash lens. Not many artifacts were recovered from this trench. The excavators noted that

> Large pieces of impressed, burned hardened clay were recovered from a soil sample taken from the ash deposit. These pieces appear to be remnants of a mudcat, or partial mudcat, chimney. It is believed that this ashy, charcoal rich feature and the associated bricks are the remains of the hearth and chimney of the kitchen portion of the house [Green et al. 1996:104].

This is the one significant feature noted and explored at the site.

Testing yielded 1,538 artifacts in the following categories: Domestic/Furnishings, n = 694; Architectural, n = 600; Personal, n = 43; Activities, n = 42; and Indeterminate, n = 159. In this case, artifacts were classed in the indeterminate category that could not be positively identified as to function, even if the material was recognizable.

At 429 sherds, bottle glass is the largest group represented in the assemblage. Although most represent semiautomated (post-1880) or fully automated machine-made (by 1910) bottles, a few examples of snap-case bases (1850–1900), post bottom plate molds (1820–1890), panel bottles (1860–1900), and chamfered cornered snuff bottles (1870–1920) were recovered (Green et al. 1996:111). Other glass sherds, table glass (n = 34), and lamp glass sherds (n = 22) were recovered as well. The lamp glass represents the kerosene lamps and lanterns that served as the only light source for the house, since electricity did not come to Klondike until the 1930s.

A range of ceramics was recovered, representing both fine tablewares and utilitarian wares. Tablewares are mostly whiteware (n = 89), ironstone (n = 27), and porcelain (n = 20). Some whitewares are decorated with overglaze monochrome and polychrome floral decalcomania (1880–1920) and imitation flow blue (1890–1925). A single ironstone sherd with a copper rim band (ca. 1880–1910) was recovered. Stonewares (n = 33) served as the primary utilitarian ceramic type.

> Six varieties of glazed wares are represented in the assemblage: salt vapor interior and exterior (pre-1875); salt-glazed exterior with natural clay-slipped interior (1840–1900); natural clay-slipped interior and exterior (1875–1900); Bristol-slipped exterior with natural clay slipped interior (1890–1915); Bristol-slipped interior and exterior (post 1900); and dry exterior with Bristol-slipped interior (post 1890) [Green et al. 1996:115].

Of the architectural items, 309 handmade brick fragments were recovered, along with 88 wire nails and 28 cut nails. Although no structural evidence of a house was discovered, based on artifact clusters Geo-Marine deduced that it most probably stood north and west of the mound originally believed to be the house site. It was theorized that the house went through episodes of construction and addition based on the artifactual evidence and the fact that there were 10 children in the family. The assemblage produced by 41DT209 is from a slightly earlier period than is represented at the other Friendship farmsteads and does not appear to be compromised by later occupations. Therefore, it serves as a good example of an African American farmstead at the turn of the century in northeast Texas.

41DT249, Wallace Carter Farmstead

This site, dating ca. 1917–1958, is located along the east-west portion of the road that leads from Klondike to Friendship. It lies 350 m north of Honey Creek, 500 m northwest of Free Hope Church, and 250 m south of the new Friendship Cemetery. It is in an upland setting that was originally a post oak savannah with an upland prairie to the north. Today the vegetation consists of grasses, bois d'arc trees, small oak trees, and ornamental plants (yuccas and irises). With the filling of Cooper Lake, the water level is presently very close to the site. The soil is mapped as Crockett loam (Jurney et al. 1993; Green et al. 1996).

This site was not identified until 1990. It was not present on the few early-twentieth-century maps examined at that time, and the investigators theorized the reason for that was because "it is so far removed from a maintained road, it could have been missed" (Jurney et al. 1993:8-211). No other archival research was conducted that could have clued the investigators to its presence. Nor were

subsurface investigations performed at the survey level. The site was mapped, and surface concentrations were noted. A limited, uncontrolled surface collection of historic materials was made.

As with the other sites discussed above, systematic archival and informant research was done when Geo-Marine began work. Surface reconnaissance also discovered a previously unrecorded well depression. Site 41DT249 was identified by informant Jeff Blandon as the Wallace Carter farmstead. Records show that Wallace and Mary Lou Carter bought 4 acres from J. B. Blandon in 1917. Jeff Blandon, the informant, visited the site to point out its different features, including the Carter house, a small barn, and a cow corral. All surface features were associated with the Carter occupation and were clustered mostly in the northern portion of the site. Mr. Blandon's father owned the land before the Carters, and it became evident from the artifacts recovered (see below) that the original Blandon house was also at this location.

Archeological testing consisted of the excavation of forty-one 0.5-x-0.5-m units and three backhoe trenches to investigate the different components of the site, as well as its overall layout (Figure 46). The area thought to be the Carter house yielded little information, either structurally or artifactually. As on 41DT208, it was thought that the Carter house originally stood on piers, thus leaving no architectural footprint. The only concentration of materials from this occupation was recovered from units near an adjacent copse of trees.

The area of the Blandon house had much more archeological integrity. Soil erosion was less here due to more dense vegetational growth and a significant number of large abandoned objects (e.g., appliances, a metal cistern, etc.) that served to retain the soil. Once these objects were removed, a slight house mound could be detected. Many more domestic items were recovered from this context.

This testing served as a guide for the placement of three backhoe trenches. Trench 1 was excavated in a rectangular depression thought to be a storm cellar at the northeastern corner of the site. This depression held water and had to be pumped before earthmoving activities could commence. Due to the saturation of the soil, the trench was not stable, and it could not be investigated thoroughly. However, a large disturbance was observed in the wall profile along with sizable pieces of sheet metal and posts. With the small amount of examination allowed, it was determined that this feature was most probably a storm cellar.

Trench 2 was excavated across the well, exposing a shaft 17 ft deep and lined with machine-made bricks. Due to the regularity of its shape, it was most likely machine dug. Trench 3 was excavated across the southern house mound area (the Blandon house) just east of the metal cistern. A dark, organic, ashy lens was observed in the trench wall, and it was conjectured that this had been the house site and that the building had burned in place at about the time the Carters bought the property.

From the excavations, a total of 919 items was recovered in the following categories: Domestic/Furnishings, n = 268; Architectural, n = 312; Activities, n = 98; Personal, n = 2; and Indeterminate, n = 239 (Green et al. 1996:126). The largest artifact class, architectural items, consists mostly of wire nails (n = 213), with only 2 cut nails being recovered. The large percentage of wire nails (available by 1890) coincides well with a twentieth-century occupation. Other items present are 51 window glass sherds, 7 handmade brick fragments, 8 machine-made brick fragments, and a few other artifacts of late historic origin.

Bottle glass dominates the Domestic/Furnishings category with 160 sherds. These represent a wide variety of vessels for food, cosmetics, and medicinal preparations. All were manufactured using either semiautomated (post-1880) or fully automated machine (by 1910) techniques. One whole specimen, a Rawleigh's (in script) bottle, contained a tonic manufactured in Freeport, Illinois, by W. T. Rawleigh. It was available from 1889 to the late 1980s. The bottle itself was manufactured by the Illinois Glass Co. in Alton, Illinois, between 1916 and 1929 (Green et al. 1996:126). Other glass recovered includes 12 sherds of table glass and 6 sherds of lamp glass.

Both fine tablewares and utilitarian wares are represented in the 44 ceramic sherds. Most of the 23 ironstone sherds are "plain, thick pieces of the type made in the latter part of their production (ca. 1880s–1910)" (Green et al. 1996:130), although one is blue banded. The 14 whiteware sherds are decorated only with molded designs or are undecorated. One refined earthenware sherd is unidentifiable due to burning. Two undecorated porcelain sherds, one of which is a gizzard stone, also are in the assemblage. The remaining four sherds are stonewares, including natural clay slipped interior

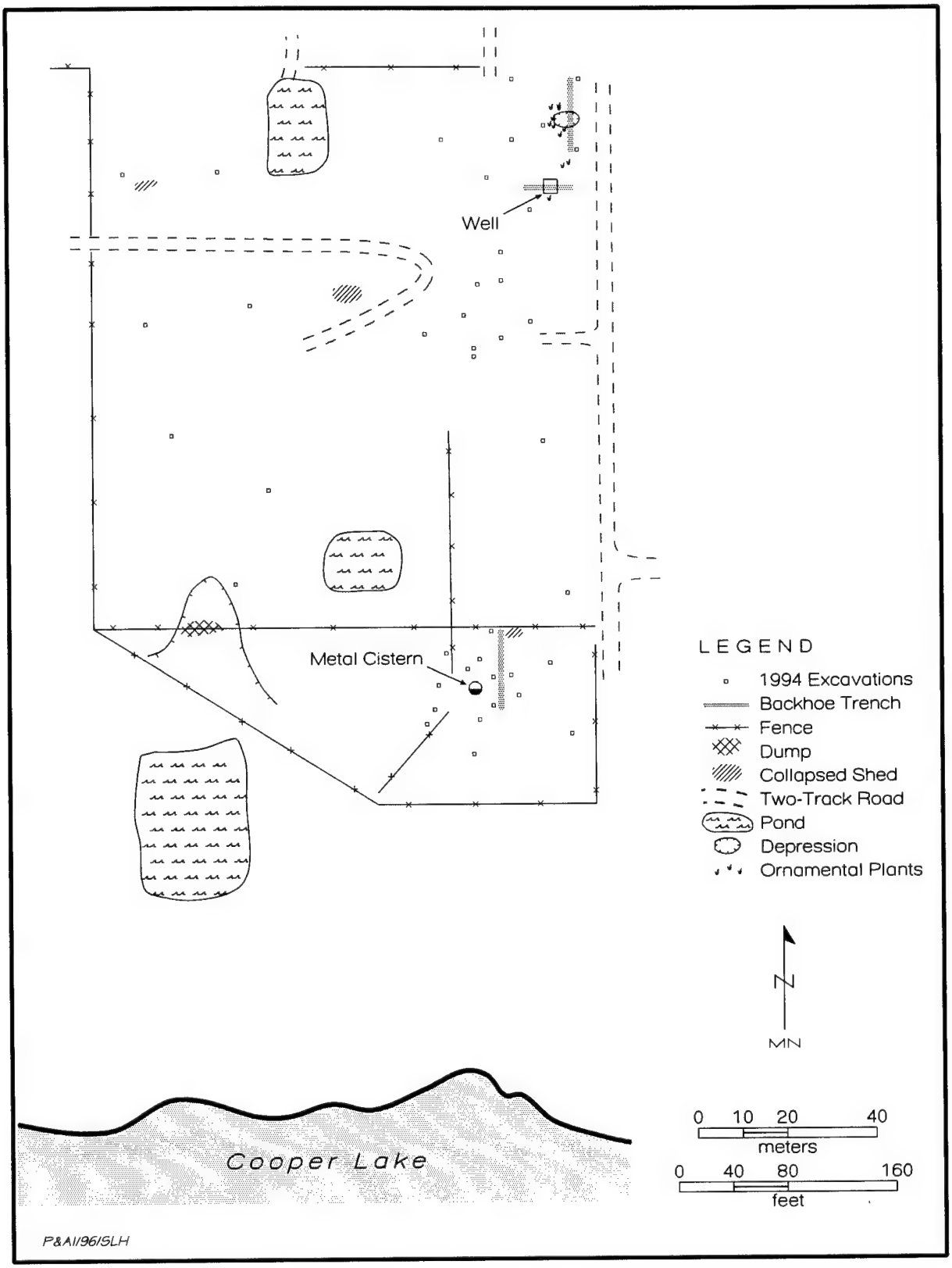


Figure 46. Plan of 41DT249 showing surface features and 1994 excavations.

and exterior (1875–1900) and Bristol-slipped exterior and natural clay slipped interior (1890–1915).

The only other large group of materials is from the Activities category and consists of nuts, bolts, washers, and the like. As with 41DT208, the Indeterminate category consists of objects that could not be identified as to function, even if the material could be identified.

At the completion of investigations, Geo-Marine concluded that the site had not yielded the type or quantity of information that had been hoped for initially. Evidence for the Carter occupation had been severely impacted through loss of the plow zone. As a result, no data on the spatial layout of the farmstead or significant amounts of artifacts were recovered. The situation at the Blandon house was little better, even though the location of the structure itself could be inferred. The researchers theorized that the household was small and that the family held few possessions, based on that scant information.

SINCLAIR CEMETERY, 41DT105

Of the five historic cemeteries originally located within the Cooper Lake project area, only one—41DT105, the Sinclair Cemetery in the Granny's Neck (or Pecan Grove) area—received detailed archival, informant, and archeological research before it was relocated. This cemetery was located 5 km south of Cooper, 1.8 km north of the South Sulphur River, and 1.4 km south of Doctors Creek on the ridge that separates the two waterways.

The initial investigations were conducted by the University of North Texas in 1986. The primary concern during this phase of work was to locate "the lost cemetery" (Lebo 1988:119). It was known in local folk history that such a cemetery existed, but its location and the identities of the individuals interred there had been lost when "the cemetery was abandoned and when the markers were removed" (Lebo 1988:119). Numerous informants were interviewed for data pertaining to this burial ground. The general location was narrowed down to "an elevated point of the J. F. Sinclair property," and it was reported that "the markers were white granite tablets and were tightly clustered in a 25 by 30-foot area" (Lebo 1988:119). Informant W. John Banks remembered last seeing markers in the cemetery between 1938 and 1940. Researchers theorized that the cemetery was abandoned ca. 1900 (Lebo 1988: 120). After abandonment, the land was plowed, and it subsequently was used for grazing. Various informants reported anywhere between 12 and 20 graves in the cemetery.

Since the exact locations of the graves were not known, a front-end loader was used to remove the vegetation and the A horizon to expose the grave shafts. Sixteen graves were identified, all lying on a basic east-west orientation and most in two rows that ran north-south, with one burial being isolated to the northwest of the main group (Figure 47). The graves were recorded, marked, and then reburied until such time as they would be relocated.

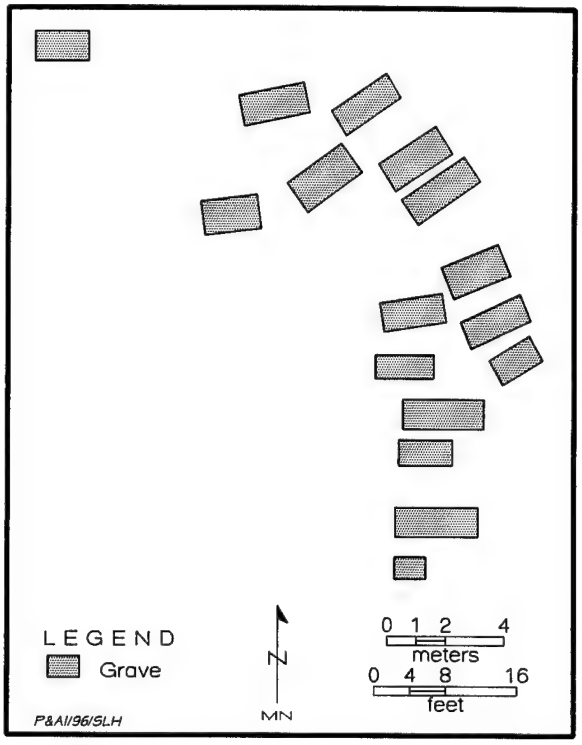


Figure 47. Plan of 41DT105 showing grave locations.

As part of this same project, the University of North Texas participated in the relocation of the nearby Tucker Cemetery (41DT104), where the main objective was relocation and not archeological investigation. From that experience, they developed a methodology by which future relocations could be accomplished with better archeological data recovery, and this is the methodology that was implemented by Southern Methodist University at the Sinclair Cemetery in 1989 (Winchell et al. 1992). Prior to the removal of any burials, exhaustive archival and informant research was done to ascertain the identi-

ties of the individuals who might have been buried at 41DT105. As the site name indicates, it was believed locally that this cemetery was the last resting place of members of the Sinclair (or St. Clair) family.

Systematic research in the primary documents concerned with the area and the family in question provided contradictory evidence as to such a possibility. Therefore, a series of hypotheses was compiled by Winchell et al. (1992:32), as follows:

> Hypothesis 1: Many of the individuals interred at 41DT105 are Sinclair family members listed on the 1850 to 1880 census taken in the Granny's Neck area.
>
> Ho1: There are few or no members of the Sinclair family buried at 41DT105.
>
> Hypothesis 2: The family patriarch (Charles Sinclair) and matriarch (Mary Sinclair) are buried at 41DT105.
>
> Ho2: The family patriarch and matriarch are not buried at 41DT105.
>
> Hypothesis 3: The establishment of 41DT105 was some time prior to the Civil War. Such family members as Charles or other individuals (ones who did not marry out) missing from the 1860 census were interred at 41DT105.
>
> Ho3: The establishment of 41DT105 was some time after the Civil War. Family members who are missing from the 1870 census and later were interred at the cemetery.
>
> An additional hypothesis that was offered held that 41DT105 may actually represent a small cemetery used by several of the nearby Granny's Neck households and not simply by one family. In the event that this was the case, its abandonment probably would have occurred when more formal community cemeteries superseded such isolated family burial grounds.

Having generated this list of possibilities based on archival information, the only way to confirm or refute any of them was to excavate the burials, examine them for any data they might offer, and apply that knowledge to the hypotheses.

Disinterment of the remains at 41DT105 was approached in a systematic manner. The fill of each grave was separated into discrete components and then screened to recover any artifacts that would have been associated with the body directly or included as grave goods. The skeletal elements themselves also were carefully recovered and analyzed in an attempt to gain information relevant to cultural patterns such as disease or nutritional deficiencies caused by poor sanitation or malnutrition.

Several types of data were generated from the investigation. Artifacts recovered from the grave fills offered a way to date the cemetery as a whole and to seriate the burials, that is, to discover the order in which individuals were interred and possible familial relations between them. Associated artifacts also were used to make determinations on social status/economic standing and mortuary practices in the region.

The skeletal materials were studied to provide basic information such as sex, age, and race whenever possible. It was hoped that positive identifications could be made for each individual, but that proved to be an unattainable goal. Most importantly, evidence of childhood stress and skeletal and dental pathologies were recorded. That served to give a unique perspective into the life experiences of particular individuals as well as the health of the general population.

Based on the various diagnostic artifacts recovered, the researchers dated use of the cemetery to ca. the 1850s through 1870s, with none of the interments occurring earlier than 1850, and only one burial possibly dating to the 1875–1885 period (Winchell et al. 1992:164). An attempt also was made to discover a sequence in which the burials were made, their relative spatial distributions, and possible familial relations. The seriation of the burials was based on a set of six indexes derived from temporally sensitive artifact classes: coffin screws, tacks per coffin, nails per coffin, and shape (making up the Coffin Parts Indexes); and buttons and shoes, making up the Clothing Indexes (Winchell et at. 1994:165).

Once an order was proposed for the burials, it was possible to study the cemetery layout over time. It was common in traditional Southern folk cemeteries to arrange individuals in a family cluster, and particularly to place the wife to the left side of her husband. Empty plots would sometimes be left near individuals to accommodate later burials of family

members or spouses (Winchell et al. 1994:27). The possibility for such an arrangement was proposed for the Sinclair Cemetery. For example, the first phase of interments could have occurred in the following manner:

> The first two interments proposed for Phase I are Burials 7 and 8. The placement of Burial 7 (aged 6–9 months) adjacent to Burial 8 may indicate that this was a mother-daughter burial, although this cannot be confirmed by empirical data. The third and fourth interments (Burials 11 and 3) appear to be positioned to indicate that they are not direct family members of Burials 7 and 8. Consequently, the elder male in Burial 11 and the 12–15 year old (gender not determinable) in Burial 3 indicate either adjacent families or household members not considered close kin to the first two interments. Burial 11 is placed along the initial row but far enough north of Burial 7 to make the lack of kinship self-evident. Burial 3 is placed to the west possibly to break the linear monotony of the evolving pattern [Winchell et al. 1992:176].

The artifact assemblage also allowed researchers to develop a socioeconomic profile of the community of people buried at 41DT105. The one obvious characteristic shared by all burials was their lack of ornamentation or decorative coffin elements, which were widely available at that time.

> It is abundantly clear from this example that 41DT105 coffins were fabricated with minimal cost using the two least-expensive items available. In both cases, coffin screws and lining tacks were mostly functional in design and were needed to complete "bottom of the line" coffins [Winchell et al. 1992:173].

Also, the bodies were buried with little in the way of personal adornment. This led the investigators to conclude that these people lived at the lowest level of the socioeconomic scale.

The skeletal and dental materials recovered provide a health and racial profile for the population. Shovel-shaped incisors are present in two individuals suggesting possible Native American or mestizo extraction. No other definitive evidence of racial characteristics were observed. For the most part, the skeletal remains are fragmentary and badly preserved, but evidence of harsh living conditions is indicated by a variety of pathologies. Dental enamel structure defects (e.g., hypoplasia lines and Wilson Bands) are the most diagnostic for evidence of stress. Almost all members of this population exhibit such defects, which are usually a result of nutritional deficiencies or systematic disease.

> The teeth of many of the individuals, in fact, documented numerous and even nearly-continuous episodes of stress. If, as is most likely, this stress is primarily related to nutritional deficiencies, it further corroborates the evidence derived from the material culture associated with the burials that these people were socioeconomically depressed [Winchell et al. 1992:172].

Based on all the evidence recovered in the archeological investigations, the original hypotheses could be examined. The material culture recovered dates from an earlier period than the reported Sinclair occupation in the Granny's Neck area. The number and nature of burials in the cemetery could not have come from a single family, more likely representing the deaths in approximately six families over a 20-year period of time. Finally, records of the Sinclairs show them to have been a family of means, whereas the individuals buried at 41DT105 seem to have come from much poorer backgrounds. Taken together, the evidence indicates that this was not the Sinclair family cemetery, and it is quite possible that no members of that family were buried there.

SOUTHERN METHODIST UNIVERSITY FARMSTEAD EXCAVATIONS: 41DT113, 41DT118, AND 41DT126

Three sites are described in this section. They are 41DT113 (John C. Wright), 41DT118 (Zephriah Dawson), and 41DT126 (Robert Hannah). They are considered together in this section because they share certain similarities. First, they are all primarily owner-occupied farmstead sites from similar time frames and adjacent historic communities within Delta County. Second, they were all excavated at a data recovery level of investigation. And third, all were excavated by Southern Methodist University.

While they are discussed together here, this does not imply that they were presented as any sort of

community study. It may have been possible that these sites, plus many of the other farmsteads recorded in the area, could have been treated in a manner similar to the Friendship sites discussed above, but since they were not approached or integrated in that fashion, they should be considered as separate, but comparable, localities.

41DT113, John C. Wright Farmstead

This short-term occupation site was located on a large terrace ridge, approximately 100 m north of Doctors Creek, 1 km southwest of the Tucker Cemetery, and 2.5 km southeast of the Dawson Cemetery. The soil was mapped as Annona loam within the Wilson-Normangee-Crockett association. Vegetation at the site consisted of grasses, a few very young cedar trees, and two large pecan trees along its southern edge (Green and Moir 1989:12-1).

The initial work on the historic component at 41DT113 was limited, as the main concern during the survey phase was with the prehistoric component. Some historic artifacts were collected from the surface around a large stock tank, and several shovel tests were dug across the area. Because the tests yielded no artifacts, however, the investigators believed that the historic component had been destroyed by construction of the stock tank.

Only when testing began on the prehistoric component was it recognized that an intact historic component was present, lying 40 m east of the stock pond. At that time, sixteen 0.5-x-0.5-m units were excavated across the site. They yielded a small amount of antebellum materials. The presence of early artifacts, though minimal, lead the investigators to recommend further work at this locality.

No informant data were gathered specific to this site, and primary documents were examined only to a minimal extent to establish a probable occupant association. John C. Wright purchased the property (acreage unspecified) in 1855 from James Harper. At the time of the purchase, Wright was apparently already in occupancy on the land. Wright was listed as paying taxes on this property during the years 1853–1856, after which he moved with his family to another location west of 41DT113. The property remained a family possession until 1911. These records, along with the small amount of early artifactual materials recovered, led the investigators to believe that the historic occupation of 41DT113 lasted only from 1853 to 1856, and that the site therefore was a discrete example of farmstead culture in Texas.

One hundred eleven 0.5-x-0.5-m units on a 2-m grid were excavated at 41DT113 (Figure 48), distributed in such a way as to "collect a representative sample of sheet refuse from the active yard of this early homestead" (Green and Moir 1989:12-5). Two features were encountered in the course of this work. Both were circular, burned, ashy stains that yielded large numbers of artifacts and burned faunal materials. Feature 1 measured 98 x 82 cm. It was excavated in one level of approximately 29 cm, and in profile it was roughly a flat-bottomed pit. A total of 101 artifacts was recovered, including 4 ceramic sherds, 2 architectural items, 72 faunal remains, 1 tin can fragment, 1 firearms-related item, and 21 miscellaneous other items (Green and Moir 1989:12-7).

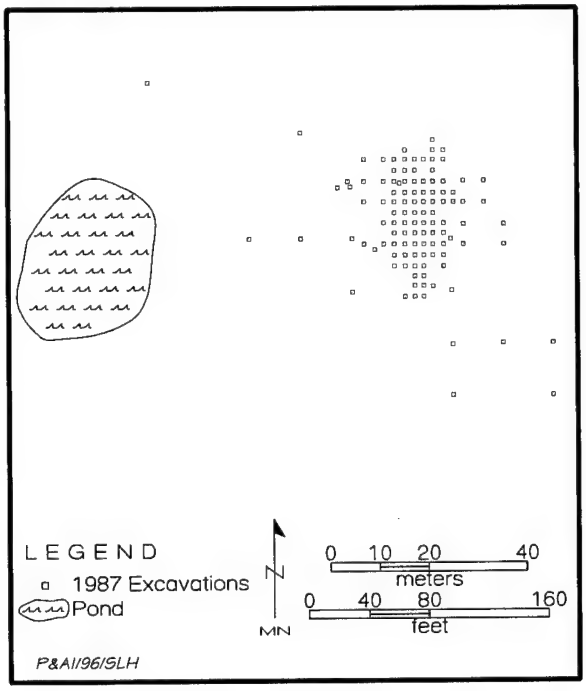


Figure 48. Plan of 41DT113 showing 1987 excavations.

Feature 2 was similar in nature. It was located very close to Feature 1 and originally considered to be part of it, but when explored further, they proved to be separate features. Feature 2 measured 90 x 76 cm in diameter. The materials recovered include 23 ceramic sherds, 2 glass sherds, 5 architectural items, 22 faunal remains, 1 piece of miscellaneous metal, 1 firearms-related item, and 2 other items (Green and Moir 1989:12-9). Both features

were interpreted as outdoor cooking pits, probably employed during the construction or repair of the chimney in the family cabin. Hence, they would have been indicative of short-term activities carried out by members of the Wright household.

Five hundred artifacts were recovered from the entire site. They were distributed in a thin scatter across 800 m². Due to the small size of the collection, it was possible to reconstruct a minimum number of ceramic vessels (n = 12) and glass bottle forms (n = 8). Some of the more diagnostic ceramics include a mulberry transfer ironstone plate, a polychrome floral hand-painted ironstone teacup, a blue transfer-printed saucer, a pinkish red spatterware teacup, a plain ironstone cup, and a blue spatterware teacup. The more diagnostic reconstructed bottles include an olive glass oval flask, a thin olive panel bottle, a thin aqua panel bottle, an aqua panel bottle, and a chamfered amber snuff jar (Green and Moir 1989:12-10). Most of the artifacts date to the 1845–1860 period, with the one exception being sherds from a lead-glazed redware vessel, an unusual occurrence in mid-nineteenth-century Texas. When combined with the documentary evidence, the artifacts reinforce the idea that this was a short-term, early occupation. The approximate location of the cabin was reconstructed using the distribution of the artifacts. The densest area of artifact clustering was taken to be the center of the house site, with densities gradually decreasing away from this.

41DT118, Zephriah Dawson Farmstead

This site was located on a small knoll 1 km north of Doctors Creek and 250 m west of the Dawson Cemetery. It was used for grazing at the time of the 1987 fieldwork and was covered with Johnsongrass, blackberry bushes, and young black locust trees. The soil was mapped as Crockett loam in the Wilson-Normangee-Crockett association (Green 1989:13-1).

No informant data were gathered specific to this site, but unlike many of the historic sites in the Cooper Lake area, archival research was conducted to the extent that Zephriah Dawson was known to be "among the first to settle in the general Cooper area of North East Texas" (Green 1989:13-3). Dawson bought 320 acres in 1854, bringing his wife and six children from Illinois, although he originally was from Pennsylvania. The family lived on the property for approximately 30 years, and the land remained in the Dawson name until 1971.

The initial testing consisted of the excavation of 20 shovel tests on a 15-m grid. Nine of these tests were sterile, and 100 artifacts were recovered from the remaining excavations. Two surface features—a brick concentration (Feature 1) and a well depression (Feature 3)—were noted and recorded as well (Figure 49). Because the artifact collection contained antebellum materials and no materials postdating 1880, the site was considered to be associated with the Dawsons.

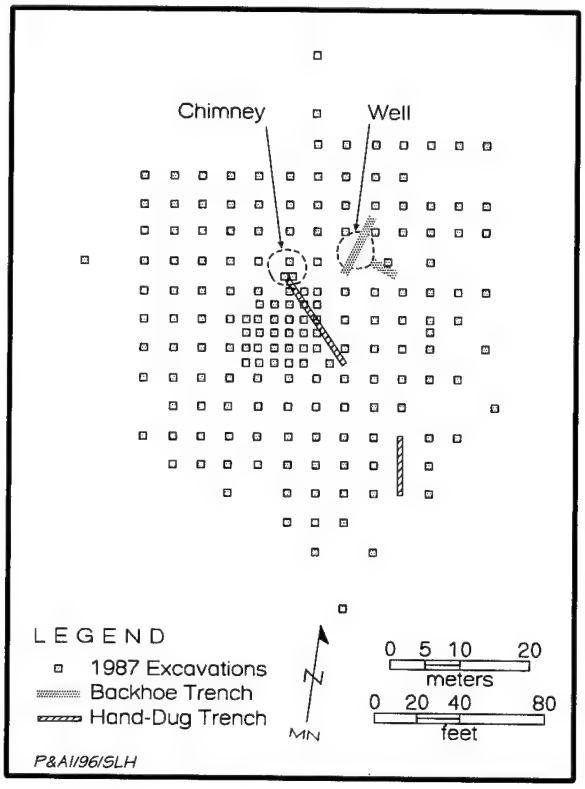


Figure 49. Plan of 41DT118 showing surface features and 1987 excavations.

The site was recommended for further work based on these findings, and an intensive program of remote sensing and mitigative excavation was planned. A magnetometer survey was conducted on three 20-x-20-m quads of the site (the fourth was not done due to time and weather restrictions). The survey recorded four magnetic anomalies, two of which were the features already known (the well and brick pile); the other two were interpreted as a cooking refuse dump and a household refuse dump. Subsurface testing consisted of the excavation of one hundred eighty-eight 0.5-x-0.5-m units on a 4-m grid

over most of the area, moving to a 2-m grid in areas where artifact densities were high and an 8-m grid around the site periphery. Both mechanical and hand-trenching was employed to investigate features.

Feature 1 was the brick concentration noted on the surface. The 3-x-1.5-m area was slightly mounded and consisted of both fragmented bricks and bricks set in place with leached mortar made of sand and burned limestone. The rubble was cleared to expose the chimney base, at which point the hearth (i.e., the interior) could be distinguished from the base itself. The chimney feature was excavated in interior (hearth) and exterior sections. The exterior portion was examined to discover construction technology. Three levels were excavated to a total depth of 86 cm to the clay subsoil. A small slit trench was dug in search of a builder's trench, and in the absence of such, it was "concluded that the bricks were placed directly on the clay subsoil" (Green 1989:13-9). These excavations exposed a total of eight vertical brick courses. The interior/hearth area was excavated only to two levels. A total of 1,552 artifacts was recovered from this feature alone. Glass sherds (both bottle and lamp) are the most abundant artifact class represented (n = 607), including pieces of "at least 7 reconstructible bottles" (Green 1989:13-9).

Feature 2 was discovered during the course of excavations in the southeast quadrant of the site. Concentrations of burned bones, stoneware fragments, and ash were encountered in three separate units and prompted the excavators to dig a trench consisting of adjacent 0.5-x-0.5-m units. The completed trench was 7 m long, running in a north-south direction. There was only slight evidence of the feature in the northernmost 4 m, but it became much more concentrated in the southernmost 3 m of the trench. The overlying plow zone showed no evidence of disturbance. Based on the large amount of burned faunal and floral materials, "it was concluded that this feature was the remains of a cooking refuse dump used by the Dawson family throughout their occupation" (Green 1989:13-10). The 30-year occupation was used to explain the size of the burned feature.

The well depression observed on the surface was designated Feature 3. It also was evident in the results of the magnetometer survey. It was investigated with a backhoe trench to provide a cross section. The hand-dug well shaft was 3.5 m deep. A series of slumping and cleaning episodes were evident in the cross-section profile. It also was obvious that the well originally had been dug into the edge of a geological anomaly, a deposit of dense clays. The well yielded only 39 items. Diagnostic materials include "3 handmade brick fragments, 1 cut nail, 2 stoneware sherds, 2 white ironstone sherds, 1 porcelain sherd, 14 aqua and clear bottle or jar sherds, and 13 lamp glass sherds" (Green 1989:13-10). Most of these articles seem to have come from the Dawson occupation, and it was theorized that the well was filled soon after the family left that locality.

One other hand-dug trench (the "House Trench") was excavated in the area of the original house using adjacent units. Judging from the site map, the trench was approximately 15 m in length. It started 41 cm south of Feature 1 (the chimney) and ran in a southeasterly direction to cut across the house area itself and into what would have been the back and side yards. The northern 4.5 m of the trench closest to the chimney were characterized by "a layer of brick rubble and hard, compacted ash and charcoal flecking" (Green 1989:13-13). This was interpreted as representing the inside of the house. Moving southward, the deposits shifted to a "yellowish brown sandy loam to a very dark grayish brown sandy loam that was less compact and yielded more artifacts associated with yard activities rather than house activities" (Green 1989:13-13). Most of the artifacts associated with "outdoor" types of activities, such as horseshoes, tools, stoneware, and architectural items, were recovered from the portion of the trench located in the yard. Artifacts associated with "indoor" activities, such as personal items, ceramics, and bottle and lamp glass, were recovered from the northern portion of the trench. No total counts of artifacts or specific lists of items recovered from this trench are included in the report, however.

One last backhoe trench was excavated through an anomaly detected during the magnetometer survey, and it was designated the "Anomaly Trench." This anomaly was originally considered to be cultural in nature, but upon investigation, it turned out to be geologic in origin. "The anomaly appeared to be the rather shallow intrusion of dense clays isolated in a small area. Water tended to gather and stand so that the area became extremely saturated" (Green 1989:13-13). Less than seven artifacts were recovered from the trench, including cut nail fragments, clear glass sherds, and one brick fragment. Several of the 0.5-x-0.5-m excavation

units fell within the general limits of the anomaly, most of which had very low artifact counts. Only one unit had a high artifact density. Dug within the center of the anomaly, this unit contained a concentration of materials exclusively at 10–25 cm, consisting of architectural remains, vessel glass, personal items, burned eggshells, stoneware and refined earthenware sherds, a .38 cartridge, a cast iron stove part, charcoal, stones, and miscellaneous metal fragments (Green 1989:13-13). This lens was interpreted as a buried refuse deposit, with at least one burning episode, that postdated 1880 and was associated with the late part of the Dawson family occupation.

A total of 13,361 artifacts was recovered during the excavations, dating from the mid 1840s to the mid 1880s. The analysis of the collection focused on the materials from sheet refuse contexts, which was 88 percent of the assemblage. The researchers argued that the earlier materials likely represented artifacts brought to Texas from Illinois and that they thus "provide a look at some of a Midwesterner's household preferences useful for studying and delineating patterns between the Upper versus Lower South orientations" (Green 1989:13-16). It also was argued that the high incidence of sheet refuse proved the use of a "broadcast disposal pattern in Texas" (Green 1989:13-16). This conclusion may say more about the excavation methodology than the nature of the archeological remains, however. In the search for spatial relationships based on models of farmstead layout (e.g., Jurney and Moir 1987), the primary approach at 41DT118 and the other historic sites investigated by Southern Methodist University involved the excavation of 0.5-x-0.5-m units on close-interval grids to try to identify distributional patterning. However, this approach is not as effective at identifying discrete features that are important for addressing farmstead layout and function as is an approach involving the excavation of large contiguous areas. Had the latter strategy been used at 41DT118, additional trash disposal areas comparable to Feature 2 might have been found, and the "broadcast disposal pattern" might have appeared less important.

Glass is abundantly represented in the collection, with 1,414 sherds coming from the yard. Most were manufactured in snap case molds and had hand-finished necks. "Consequently, most of them were manufactured between 1850 and 1885" (Green 1989:13-18). Table and lamp glass is represented by 104 sherds.

Among the diagnostic ceramics, some of the more interesting

> were numerous fragments of purple transfer printed ironstone vessels. The variety of vessel shapes evident indicated that the Dawsons owned a set of this ware (ca. 1840–1865). . . . Other decorated fine tablewares included geometrically molded ironstones of the 1840–1870 period, transfer printed vessels (black, purple, etc.) blue spatterware, banded and annular (engine turned) ironstones, slipped, banded, and finger painted whitewares, monochrome blue and polychrome hand painted wares, copper luster and brown banded ironstones, and semi-vitrified (high fired) bluish tinted ironstones [Green 1989:13–18].

Stonewares also are present among the ceramics, including some late 1840s–early 1870s alkaline-glazed stonewares. All stonewares are of nineteenth-century types. Other stoneware forms include several tobacco pipes, some similar to the 1880s Pamplin, or "elbow," types consisting of a straight-sided bowl with a socket for inserting a reed stem.

Most of the artifacts in the architectural group are fragments of handmade bricks. Most of the nails are of the cut variety, with only a few wire nails being recovered. Window glass, mortar, and other hardware were classified under this category as well.

Bones were separated out of the faunal/floral category, and fragments of 19 mammal species were identified. "The Dawson diet exhibits a traditional rural southern aspect in the dominance of pork in the diet. Wild food species indicate that hunting was still economically feasible, since many wild species had not been depleted or exterminated in the 1850s and 1860s" (Green 1989:13-19).

41DT126, Robert Hannah Farmstead

This ca. 1840s–1920s site was located 300 m south of Doctors Creek and east of the Harper's Crossing Road. It sat on a high finger of land that jutted out into the floodplain. At the time of the 1987 work, the vegetation consisted of low grasses, blackberry bushes, wild roses, a single bois d'arc tree, a single honey locust tree, and a very young hackberry tree which was growing out of the well

depression. Growing along the fence line near the road were several pecan, hackberry, and elm trees. The soil was of the Freestone-Hicota complex within the Wilson-Normangee-Crockett association (Green 1995:495).

Site 41DT126 represents a difficult case of interpretation. As with many of the sites in the Cooper Lake area, complete and systematic archival and informant research were not conducted. Without such information, it is difficult to make a well-informed analysis on a site as complex as this one.

Researchers offered this tentative interpretation for the evidence found:

> The Hannah Site, represents a long term, domestic occupation dating from the late 1840s to the 1920s. There also was an indication from artifacts of earlier, undocumented occupation, possibly "Immigrant Indian" or an Anglo with a Native American wife. This indication came with the recovery of large pieces of traditional clay pottery found in close proximity with large pieces of European ceramics in a small area in the northwest portion of the site [Green 1995: 495].

Of the documentary research that was compiled, most of it pertained to land titles. This property changed hands many times over the years, but Robert Hannah apparently was the first owner resident on the land. He had an agreement with the original landholder in 1855 and became the assignee of 320 acres in 1873. In 1860, "Robert Hannah is listed as a 48 year-old farmer with two teenage girls, presumably his daughters, in his residence" (Green 1995:497). The researchers believed that the aboriginal pottery found on the site was made there, but they could not directly connect that activity to members of Hannah's household. That led them to hypothesize that there might have been an occupation previous to Hannah's that produced such wares. After Hannah's stay at 41DT126 ended in 1882, tenancy there became serial in nature.

The initial fieldwork consisted of 20 shovel tests excavated on a 10-m grid across the site. Two feature areas were encountered during these investigations. The first "yielded a large quantity of large late Native American pot sherds. Charcoal flecking and burnt clay in heavy concentrations were also encountered throughout the unit" (Green 1995:497). Interest in this deposit prompted the excavators to expand the unit to 0.5 x 0.5 m in size. Stains in the walls of the unit seemed to indicate that the feature consisted of something more than just a single in situ pot.

The second feature area was located in the western portion of the site along the fence line. Two units 4 m apart contained high concentrations of artifacts, ash, and charcoal. It was theorized that this deposit was due to the dumping of fireplace refuse.

Interest was expressed in exploring 41DT126 further on the basis of it being a "long-term, early settled, multi-component rural occupation for northeast Texas" (Green 1995:497), and a large amount of time and effort went into trying to recover "positive proof of a possible Immigrant Indian component" (Green 1995:497).

One hundred thirty 0.5-x-0.5-m units were dug on a grid that consisted of 2-, 4-, and 8-m intervals (Figure 50). The interior of the site was tested at a closer (2-m) interval, and the interval increased to 4 and 8 m toward the periphery. Seventy-one units were dug in the main section of the site. The excavations identified a concentration of earlier materials (predating 1870), mostly nails and ceramics, in the northern and eastern part of the site. Features were trenched either mechanically or by hand, and ultimately the entire surface was mechanically scraped to try to discern features.

A single hand-dug trench 9.5 m long was excavated to bisect the original dirt fill from the well. The units closest to the well exhibited stratigraphy indicative of the well-digging sequence. The basic laws of stratigraphy seem to have been at work here, since artifacts in the A horizon were of a later date (1880–1920) than those in the third layer, which predated 1880. The investigators argued that this deposition sequence, with little material present in the second layer, meant that "only a slight deposition of artifacts before and during the time of the digging of the well" had occurred (Green 1995:499). They also concluded that this deposit of backdirt served to seal any pre-1880 occupation in the vicinity of the well.

Mechanical scraping over a majority of the site was conducted to reveal any other features or anomalies. An average of 20 cm (the A horizon) was removed, after which the area was scraped by hand to delineate stains. Most stains were determined to be noncultural in origin.

Feature 1 was the aboriginal pottery concentra-

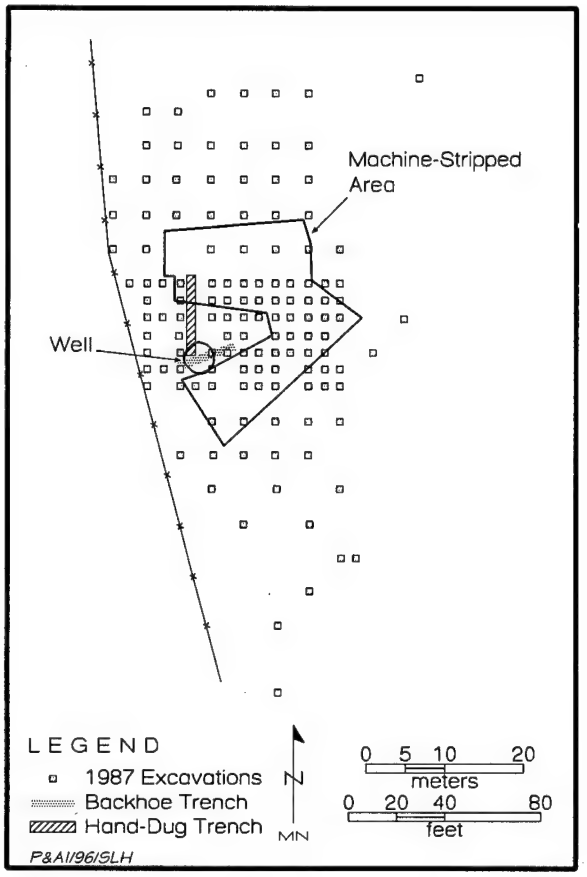


Figure 50. Plan of 41DT126 showing surface features and 1987 excavations.

tion found during the initial testing. The original unit of 0.5-x-0.5 m was expanded to create a 1-x-0.5-m unit. This new unit was excavated in four 10-cm levels. Level 1 yielded only historic materials dating no earlier than the 1870s, except for two small undecorated aboriginal sherds from the bottom of the level. No evidence of a stain was apparent. Level 2 provided little more information until the base of the level, where "a darker mottled rusty brown organic stain flecked with charcoal began to emerge" (Green 1995:499). Historic and prehistoric artifacts (all pottery sherds, except one flake) were equally represented in this level. The undecorated prehistoric ceramics were larger than those in Level 1, and they were distributed throughout the unit.

Level 3 contained 10 sherds of aboriginal pottery, charcoal, and charred nutshells exclusively. "Two large basal sherds were found in situ at 24 cm (9.4 in) and were associated with the organic stain" (Green 1995:499). This stain had disappeared by the end of the level, and Level 4 contained no cultural materials or feature evidence. A small circular stain was observed at the base of Level 4 in the adjacent original 0.5-x-0.5-m unit, however, and it was cross sectioned as a possible post mold, the only one encountered at the site. No profile drawing of Feature 1 is included in the report, but the part exposed in the manual excavations is described as being linear, 10 cm thick in profile at its west end, and 3 cm thick in profile at its east end.

Subsequent mechanical scraping greatly enlarged the known size of Feature 1 to a 7-x-3-m area, defined by both concentrations and single sherds of pottery as well as the presence of the organic stain noted previously. Two slit trenches were excavated to further explore this area, but the results of that effort are not reported specifically. The aboriginal pottery sherds recovered during the scraping and the manual excavations were reconstructed into four partial carinated bowls. The analysts felt that three might fit comfortably as prehistoric Caddoan wares but that the fourth vessel clearly was non-Caddoan (based on the presence of an unusual style of punctations forming a design not common on Caddoan pots), and they concluded that these vessels could represent use by immigrant Native Americans (Green 1995:506–513). At a depth of 22–25 cm below the surface in the scraped area, these sherds were mixed with European ceramics and glass dating ca. 1825–1850.

The researchers speculated that Feature 1 might be the remains of a Native American dwelling, admitting that the evidence was equivocal. The unusual nature of one of the vessels and the fact that few other Native American artifacts were recovered apparently convinced them that, if this was a structure, it did not relate to a prehistoric Caddoan occupation. This conclusion, along with the recovery of some European artifacts dating to the second quarter of the nineteenth century, gave rise to the suggestion that these materials might represent use by immigrant Native Americans shortly before the Hannahs moved onto the property.

Feature 2 was the well depression observed on the surface. Trenching with a backhoe and soil coring revealed that this feature extended 3.5 m below the surface. Judging from its profile, the well appeared to have been dug in two sections, with various other episodes of slumping and redigging, especially in the lower meter. The upper section was wider than the lower section, and a shelf had

been dug at approximately 2 m. Little in the way of artifacts was recovered from the lower portion, except for a few brick fragments and some cut nails. However, the top 1.5 m of the well shaft contained abundant early-twentieth-century refuse. "Large balls of barbed wire, old buggy and car parts, small appliances, lanterns, personal items, and large numbers of stoneware, glass, and refined earthenware dating to the 1920s and 1930s were recovered, with quite a number also cross-mending" (Green 1995: 501).

When originally encountered, Feature 3 was thought to have been the remains of a mudcat chimney. It contained "a large concentration of burnt clay, some charcoal and ash, and an abundance of artifacts, mainly nails" (Green 1995:501). As the surrounding area was investigated further, the feature was reinterpreted as a small trash-burning area outside the south and east portions of the house. Artifacts dating ca. 1850–1900 in the surrounding units suggest that this might have been part of an even larger dumping area.

Feature 4 was one of the stains uncovered as a result of the mechanical scraping. It was basically circular in shape, measuring 70 cm in diameter, and it contained charcoal, ash, burned clay, and burned pig bone fragments. It was interpreted as either a small cooking pit or a garbage pit.

Feature 5 was very near Features 3 and 4, and it was very similar to them. It covered 1 m^2, was amorphous in shape, and contained charcoal and ash. Feature 5 was thought to be a garbage pit within a larger refuse area. Artifacts recovered from the feature itself include burned pig bone fragments, eggshells, refined earthenware sherds, cut nail fragments, bottle glass, burned clay, and charcoal (Green 1995:501). Diagnostic materials indicate post-1860 to pre-1900 deposition.

Feature 6 was located in the northeastern part of the mechanically scraped area. It was a shallow oval pit, contained charcoal, and yielded 174 artifacts, most of which are brick fragments. "Other materials included refined earthenware, bottle glass, burned pig bone, cut nail fragments, tin can fragments, and a single harness ring" (Green 1995:502). Since the stain was located fairly close to the house, the bricks could have been associated with the chimney.

A total of 12,380 artifacts was recovered from 41DT126, mostly from sheet refuse contexts (93 percent). The assemblage is a good representation of personal and household material culture from the early 1850s to the 1900s. As mentioned above, some earlier (1830s–1840s) ceramic and glass sherds also were recovered that could represent an occupation predating that of the Hannahs.

The analysis offered for the artifact assemblage is based solely on the sheet refuse materials, thus making for a data universe of 11,008 items. Vessel glass makes up a sizable portion of the collection (34 percent). Eighty-five percent of the bottles were made in snap case molds and had hand-finished necks. In addition, "an assemblage of 1930s bottles was encountered in the well, apparently dumped as trash by someone living elsewhere, possibly across the road at the time. Still, bottle glass and ceramics indicated some continued light occupation of the site between 1900 and 1920" (Green 1995:502). Table glass is represented by sherds of bowls, pressed glass, vessels, pitchers, tumblers, and stemmed ware. One hundred nineteen glass sherds were attributed to lamp or lighting vessels.

Of the ceramics, most tablewares are decorated, "modestly priced mid-nineteenth century wares" (Green 1995:503). Ironstone decorations include hand-painted polychrome floral; monochrome (red) spatterware; polychrome (red and blue) spatterware; molded; stamped and stenciled floral and geometric patterns; blue shell edged; and blue green and mulberry transfer print. Other ceramic forms include plain ironstone, whiteware (plain and light relief), and banded and engine-turned annular wares. Both soft and hard paste porcelains are present. "Stonewares exhibited the full range of pre-1910 varieties with alkaline, natural clay slipped, salt vapor, dry bodied, heavy salt glazed, and Bristol slipped" (Green 1995:504). Two particularly interesting pieces are an almost intact alkaline-glazed "drinking cup" and most of an alkaline-glazed plate. Stoneware forms also include several different types of reeded-stem tobacco pipes, varying in quality from high-fired redware to thin and poorly made.

Architectural items are predominantly fragments of handmade bricks. Both cut and wire nails are present, but wire nails are far in the minority. Other materials include window glass, soft mortar, screws, hinges, and lock plates (Green 1995:505). Also recovered were a variety of personal items representing all parts of the occupation span, consisting of such things as cartridges, eating utensils, buttons, and the like.

The faunal remains contain specimens of pig

(the dominant species within the assemblage), cattle, cottontail, and whitetail deer. Aquatic resources are represented as well. From this collection, it would seem that some reliance was placed on wild animal food resources in the frontier setting, as well as the traditional Southern rural use of pork as the meat of choice.

Excluding the enigmatic remains from Feature 1, the data from 41DT126 offer a view of material culture on a frontier farmstead that was occupied serially through the latter half of the nineteenth century and the early decades of the twentieth century. Hence, the value of the site lies in the fact that it "represents an extensive data base for reconstructing some segments of household items and activities for this type of site and the gradual changes that took place in those settings and materials" (Green 1985:513).

JAMES FRANKS FARMSTEAD, 41DT97

The James Franks site, 41DT97, is the most thoroughly studied farmstead at Cooper Lake, with all the work there being done by the University of North Texas (Perttula 1988, 1989b). The thoroughness of both the fieldwork and the data analysis sets it apart from the other investigations in the project area. The site was situated on the edge of a prominent upland knoll approximately 400 m north of Doctors Creek. It was in an upland pasture vegetated with Johnsongrass, goatweed, and a bois d'arc grove near its southern end. The soils at this site are mapped as Annona loam (Perttula 1988:60).

Site 41DT97 was recorded originally as a multicomponent site, with early Caddoan prehistoric materials present on the surface but not substantially present in subsurface tests. The initial survey testing, designed to investigate an area of 6,000 m^2, consisted of one shovel test and two backhoe trenches which narrowed the site area down to 2,000 m^2. The majority of the intact deposits represented a briefly occupied and temporally restricted pre-1870 farmstead. Those deposits were typically 13–15 cm in depth.

While there was evidence for serious erosion at the site, its contextual integrity seemed to be good. No cultural features were evident on the surface, but surface and subsurface investigations recovered handmade brick fragments, transfer-printed refined earthenwares, and cut nails. This would prove to be one of the earliest sites in the Cooper Lake area, and since it was located in an area slated to be destroyed with the excavation of a borrow pit, testing and mitigation followed swiftly.

Systematic archival research was conducted on 41DT97 and the surrounding area. The site was associated with James Franks, an Anglo-American slave-owning yeoman farmer who immigrated from Illinois in 1852 and took up residence. "The James Franks survey is a third class headright survey originally granted and patented to James Franks consisting of 320 acres" (Perttula 1989b:9). That size acreage was a customary amount of land typically awarded to single men. In 1856, Franks acquired another 113 acres, making for a total of 433 acres in his possession.

Although Franks arrived in Texas as a single man, sometime between 1853 and 1855 he married Harriet Angeline Harris. The Harris family was originally from Alabama where Harriet was born in 1837, but apparently the Harrises were already residing in the site area when James Franks arrived. In 1856, Angeline Franks gave birth to a daughter, Ellen. James Franks died not long after, in the summer of 1857. At the time of James's death, his wife was pregnant again, and she gave birth to a son, James W., in 1858. James Franks's will divided his property between his sisters and his children, leaving only a minimal amount to his wife. She contested that will in 1859, after her marriage to Charles E. Kingston. Despite her efforts, the will remained valid. However, in 1860, Kingston was appointed guardian and administrator of the Franks estate as willed to the children.

As for James Franks's other property, the Kingston family never lived in his house, but instead built another home nearby. It is noted in the records that the original Franks house was rented out after 1859, which probably continued only until 1866. Franks had also owned two slaves. Both were eventually sold, one in 1860 and the other in 1862. As the Frankses' landholdings ultimately were split up and sold off starting mostly in 1867, the developing community of Cedar Creek grew. "In quick succession, between 1873–1888, the land was purchased in tracts ranging in size from 10–130 acres by the Dawsons, Faulkners, Grants, and other Kingstons" (Perttula 1989b:13).

The remaining Franks family members faced various fates. In 1869, Kingston remarried, indicating that Harriet Angeline had apparently died sometime before that. Franks's daughter Ellen

married Wiley Burrough in 1873 and subsequently moved to the community of Ben Franklin along with her brother James W. He was killed in 1888 in the Oklahoma Territory, with his death being related to his involvement in the Delta County barbed wire fence wars.

Archival research was only one component of the testing/mitigation program. Testing began with a series of 42 shovel tests excavated to delineate the site boundaries and to attempt to locate features and/or artifact concentrations. Only 10 of the shovel tests yielded cultural materials. This was followed with the excavation of a single 1-x-1-m unit placed in the area of highest artifact density to obtain a larger sample of material culture. Most of the materials recovered came from the uppermost 10 cm.

The next phase of testing consisted of mechanically scraping two areas (to a depth of 10 cm or less) to expose cultural features. Area 1, measuring 3.5 x 8.6 m, was placed near the edge of the knoll but exposed nothing of interest. Area 2, measuring 2.8 x 15.7 m, exposed "a substantial area of disintegrating handmade brick, trending northwest-southeast and several limestone cobbles" (Perttula 1989b:19), all of which was at 10 cm below the surface. The brick concentration covered 5 m^2 and was adjacent to a dark charcoal-flecked area with a scatter of cut nails, daub, and one undecorated whiteware body sherd. This area was initially interpreted as a refuse scatter outside a structure.

Once this area was revealed, a 1-x-1-m unit was excavated north of Area 2 to investigate the concentration of handmade bricks. "Excavations disclosed that in profiles, the brick stain appeared to represent a trench containing quantities of handmade brick fragments, limestone cobbles, and a charcoal lens at the bottom of the trench" (Perttula 1989b:19). This trench was labeled Feature 1. Artifacts within and adjacent to the feature dated to the mid nineteenth century. At this stage, this feature was not exposed sufficiently to allow it to be interpreted. However, it was noted that the presence of "baked sand" and charcoal at the base of the pit indicated one or more burning episodes in the trench before it was filled.

Upon completion of the testing phase and based on the shovel tests and mechanical scraping, a 1,600-m^2 grid was established in which proton magnetometer and electrical resistivity surveys were conducted in an effort to locate anomalies with cultural significance. When conducting a magnetometer survey, "monopole or negative anomalies, ranging from 1 to 21 gamma (nT) indicative of less magnetic susceptibility than the surrounding soils, are considered to be of more archaeological significance" (Perttula 1989b:24). That is especially true of those that are circular in shape, suggestive of pits. One such area was located and later explored further by the electrical resistivity survey. Another low-gamma anomaly was recorded covering an area of 980 m^2, and "the lack of strong anomalies indicated a limited thermoremnant magnetism not arising from the presence of fire hearths or burned houses. Large, roughly linear low gamma anomalies (1 to 9 nT) trending north-south at the south end of the grid were suspected to also be of cultural origin" (Perttula 1989b:24).

Due to adverse weather and limited time, the electrical resistivity survey was conducted only on a 15-x-10-m area. The area of the large negative monopole anomaly coincided with a single low resistance area. Upon excavation, this proved to be a trash-filled feature over 3 m in length.

Controlled excavations were initiated following the remote sensing survey. Two types of data recovery were utilized: hand-excavation of 1-x-1-m units and subsequent mechanical stripping of the A horizon. One hundred forty 1-x-1-m units were excavated to an average depth of 13 cm using shovels and trowels, and all sediments were screened (Figure 51). One hundred twenty-eight of these units were arranged in a large block. The remaining hand-excavated units were concentrated in areas of magnetic anomalies. The initial use of arbitrary 10-cm levels was abandoned in favor of using natural levels, extending the excavations to the top of the B horizon, which proved to be fully inclusive of the cultural deposits. Generally, the entire area had been plowed, and this had displaced some cultural materials and obscured others. The site also had suffered from erosion, which had washed some materials away.

Once the hand excavations were finished, mechanical stripping was employed to "expose a large area around the completed excavation block in order to determine if additional undisturbed features were present in the large 980-sq m area with negative, monopole anomalies" (Perttula 1989b:28). A 570-m^2 area surrounding the excavation block was scraped to expose the B horizon, typically at 10–20 cm below the surface. These operations were monitored in case artifact concentrations or features were uncovered. These efforts resulted in the discovery

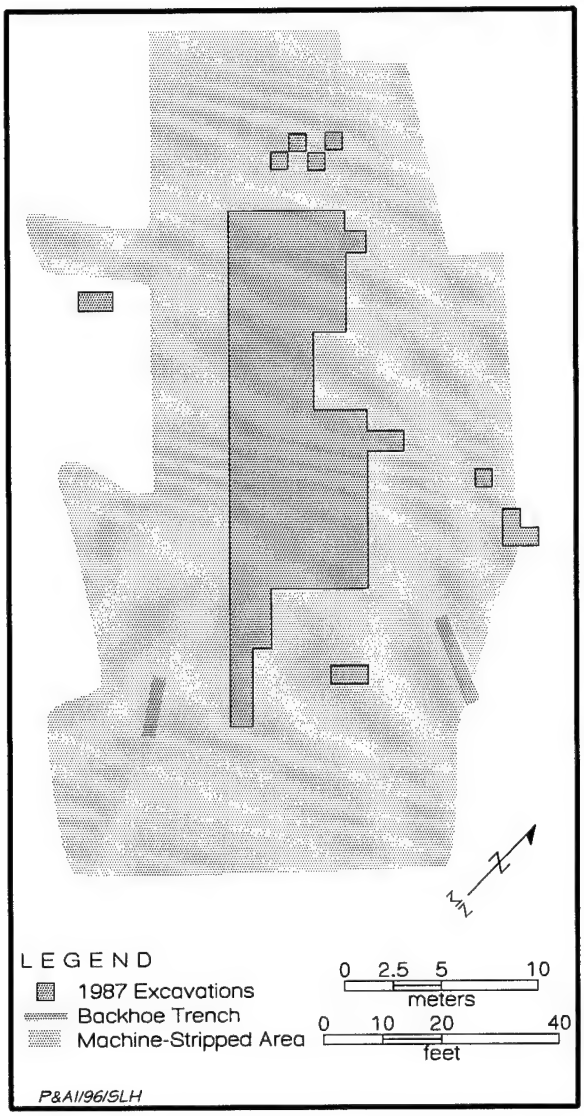


Figure 51. Plan of 41DT97 showing 1986–1987 excavations.

of only one feature (Feature 5), few artifacts, and no artifact concentrations.

Six features were uncovered at 41DT97. The initial discovery and testing of Feature 1 is discussed above. In general, the feature was linear in shape with a total length of 3.4 m and a width ranging from 35 to 50 cm. Approximately 5–8 cm were removed from the top of the feature by mechanical scraping. The feature had intact stratigraphy that varied somewhat but that can be characterized as follows:

> The upper layer (I) consisted of a dark brown (10YR 3/3) silty clay loam overlying a brown (10YR 5/3) silt loam with heavy charcoal and weathered brick mottling. The next layer (II) was a thin (2–3 cm thick) layer of heavy charcoal concentration underlaid by a brown (10YR 5/3) sand and ash layer. The matrix underlying the sand (III) contained reddish (2.5YR 4/8) fired clay [Perttula 1989b:39].

The brick inclusions were concentrated in the northern third of the feature. In addition, five fire-reddened limestone cobbles were uncovered at the top of the feature. "The margins of the feature were demarcated by a 3- to 5-cm thick zone of highly weathered brick bordered on its exterior by a 3- to 4-cm thick zone (III) of red (2.5YR 4/8) fired clay. This was more apparent on the feature's lateral margins than on its ends" (Perttula 1989b:37). None of these layers were consistent throughout the feature, nor was the feature's shape in cross section consistent across its length, although it was generally "basin-shaped with relatively steep sides" (Perttula 1989b:39).

In the final analysis, Feature 1 was interpreted as a probable smokehouse. However, in other parts of the report it is referred to as a trash pit. The smokehouse interpretation was based on several lines of evidence, including the remote sensing data, models of farmstead layout, and some of the archeological components present in the feature. Most of these are consistent with what would be expected of the archeological signature of a smokehouse, especially the in situ burning and the presence of bricks (from the remains of a firebox or piers?), but the trenchlike shape of the feature and its size (3.4 m x 50 cm) are curious and arguably would be inconsistent with a smokehouse.

Feature 2 was initially exposed at 8 cm below the surface. Its upper part was difficult to discern from the surrounding soil since it was of a very similar color. Plowing also had obscured the distinction between the feature and the adjacent soil matrix. Definition became clearer with depth. The feature was roughly ovate in shape with a maximum length of 3.1 m and a width of 60–75 cm.

The fill within Feature 2 exhibited charcoal flecking (associated with large amounts of rodent disturbance) and a large concentration of charcoal in the northern end. The cross section showed some variability, but it could be described as basin shaped with steep sides, very much like Feature 1 but much

deeper. Both ends of Feature 2 sloped up steeply. The maximum depth was 46 cm. The fill generally was homogeneous, but several ash lenses were encountered. Artifact densities generally were high within the feature, and "approximately 75% of the total site bone derives from Feature 2" (Perttula 1989b:43). No major concentrations of artifacts were observed, but most recovery came from 20–30 cm. Some of the glass and ceramic sherds cross-mended with sherds from other areas of the site, thus giving some indication of distributional patterns. This feature was interpreted as a trash pit.

Feature 3, another trash pit, was encountered at 15 cm below the surface. It was roughly oval in shape with measurements of 65 cm long and 45 cm wide. Its outline was not clearly defined, and the feature fill was mottled with both worm casts and charcoal flecks. Its overall depth was no more than 5 cm, and it had a basin shape. In addition to worm activity, root intrusions had served to distort the feature boundaries.

Feature 4, the only post mold encountered, was first identified at a depth of 9 cm. It was circular in shape, with a diameter of 10 to 12 cm. Its maximum depth was 8 cm.

Feature 5 was the only feature exposed during mechanical scraping. The top 5 cm were most probably removed during that activity. The feature was roughly oval in shape with dimensions of 1.4 x 1.1 m, and its outline was fairly distinct. "In cross-section, the feature was basin shaped, extending to 32 cmbs" (Perttula 1989b:46). The fill had a small amount of charcoal flecking, and most of the observed artifacts were burned and unburned faunal materials. Disturbances included worm and root intrusions. Feature 5 was interpreted as an outdoor cooking pit due to the evidence of burning and the presence of burned and unburned bones.

Feature 6, the final trash pit, was encountered within the excavation block. It was circular in shape measuring 45 cm in diameter. The upper 5 cm was obscured by plowing, and thus the total maximum depth was 18 cm. All of the artifacts in and around Feature 6 were domestic in nature, leading the researchers to theorize that these items were either dumped or swept into the pit during yard maintenance activities.

A total of 4,147 artifacts was recovered from the combined survey, testing, and mitigative work. The ceramics include specimens placed in the following categories: edge decorated (n = 36), transfer printed (n = 56), hand-painted whitewares (n = 58), stamp decorated (n = 7), sponge decorated (n = 8), annular slip-banded whiteware (n = 37), plain/molded (n = 9), clear glazed (n = 2), refined undecorated whiteware/ironstone (n = 273), semicoarse earthenware (n = 12), stoneware (n = 144), alkaline-glazed stoneware (n = 108), salt-glazed stoneware (n = 36), yellowware (n = 11), and brownware (n = 9). "The vessel forms represented include flatware plate forms ranging in size from 6 to 10 inches, saucers, and one possible platter. The hollowware forms include tablewares such as cups and bowls and a variety of utilitarian storage containers (jugs, crocks, and churns)" (Perttula 1989b:59). Two makers' marks were recognized, both dating to 1856.

Glass served as another important diagnostic category of material culture. Three hundred eighty-eight sherds were recovered, which represent a minimum of 31 vessels, mostly bottles. "Several different vessel forms are noted, including intoxicant vessels (wine, brandy, etc.), snuff, prescription, medicinal and various panelled types" (Perttula 1898b:86). Glass color types include: black (n = 8), dark olive green (n = 30), medium olive green (n = 49), light olive green (n = 33), amber (n = 24), green (n = 7), light green (n = 4), blue-green (n = 12), dark aqua (n = 38), light aqua (n = 126), clear/colorless (n = 54), and table glass (n = 3).

Other artifacts recovered include a fork, a handle, a coffee grinder, a meat hook, a chest-drawer pull, a cast iron stove cover, keys, smoking pipe fragments, slate, pocketknife side plates, buttons, a fastener and pin, a bead, lead fragments, horseshoes, horseshoe nails, wagon/plow/carriage parts, nails (mostly cut), bricks, daub/fired clay, and other miscellaneous objects.

Identification and analysis of the animal bones located two areas of concentration. One was at Feature 1 (the proposed smokehouse) and Feature 5 (a cooking pit) and was interpreted as a butchering locus. The second cluster was focused around the probable house locale. In that case, there seemed to be no separation between butchering and eating disposal areas. As for foodways, the James Franks family followed the southern tradition of heavy reliance on pork as a meat source. Beef and poultry also were eaten, but to a much lesser extent. Some evidence for the hunting and consumption of wild game as a supplement to the diet was found as well.

In synthesizing the work at the site, Perttula (1989b:139–169) uses both archeological and archi-

val data to focus on the issues of "settlement, site structure, and historic lifeways." One of the critical questions is the date range for the occupation. Both the primary documents and the archeological data agree that 41DT97 was utilized for a short time in the 1850s. As discussed above, James Franks was listed on the tax rolls for 1853–1856. Further, all the recovered material culture dates to ca. 1840–1860.

A second issue, spatial patterning within the sheet refuse, is examined using contour mapping of artifact densities. The largest area of significant concentration covers 60–80 m^2 and was located in what was proposed as part of the yard between the proposed smokehouse and the probable log cabin. The brick and nail scatter in the vicinity of Feature 1 was used to reinforce the idea that this was the location of a smokehouse. "The other possible trash pits and outdoor cooking pit were placed outside the major density of refuse, but were near to the smokehouse" (Perttula 1989b:140). The research indicates that this yard area was fully utilized, but the regions that would have been side or front yards were not fully explored during these investigations.

The area of the possible smokehouse seems to mark the boundary for the most heavily used portion of the yard, and perhaps even delineates the transition to a less extensively utilized part of the yard landscape. Within this yard, studies of cross-mended ceramic and glass sherds from widely separated localities suggest that it was maintained by periodic sweeping which served to disperse materials. Refuse was commonly swept into the trash pits present at the site. Even with this trend, sheet refuse within the yard was concentrated "in a band estimated to be about 2 to 8 m from one side of the house. Most of the remains were dumped or gathered near, but not in, the trash pit" (Perttula 1989b:140). Subsequent land use, such as plowing, surely affected spatial distributions in the yard area, but not to the point of completely obscuring the patterns.

Other important observations gleaned from this work are that the smaller sherds are more likely to be found within sheet trash, whereas larger sherds are more likely to have been deposited in trash pits. Sherds from more inexpensive, utilitarian wares seem to have been deposited more randomly, especially within a sheet refuse context where they were further broken up. These types of wares could have been more easily replaced. The more expensive, decorated wares seem to have been broken much more infrequently, and once broken, to have been deposited at once all together.

The question of household possessions could also be addressed considering James Franks's 1857 probate inventory. Much of Franks's real and personal property was listed and valued, but since his household furnishings were left to his wife, they were not listed. His estate, as listed, was not a particularly poor one, and "archaeological remains recovered at the site indicate that kitchen/domestic, household, personal, and clothing material possessions were not sparsely represented" (Perttula 1989b:158). Some materials recovered predate occupation of 41DT97 and indicate items that were brought to the site by either Franks or his wife.

A pivotal question for a project like this one centers on interpreting the farmstead layout. Many models have been proposed, such as those by Price (1985), Stewart-Abernathy (1986), and Jurney and Moir (1987), and these models figured prominently in the explanations offered for the spatial patterning at 41DT97. The results of the remote sensing surveys also influenced the interpretation of the archeology.

Based on these models and the location and size of magnetic anomalies, Perttula (1989b:159) proposes that a double-pen log cabin covering an area of ca. 100 m^2 stood on the crest of the knoll. In this scenario, the smokehouse would have been 10 m behind the house, with the intervening space (the yard) being defined by a generalized scatter. Features 2, 3, and 6 (all trash pits) would have defined the outer active yard, with the immediate active yard being directly around the house. No other evidence relevant to the layout of the site, such as barns, other farm buildings, or privies, was recovered. The artifacts from sheet refuse in the yard areas seem to have been deposited in secondary contexts and hence are informative mostly about refuse discard patterns. Although many activities would have taken place in the yard, discrete activity areas were not identifiable.

Another topic about which much could be learned from the combination of documentary and archeological information is Franks's socioeconomic status. The records show that he was a slaveholding farmer worth $5,000 at the time of his death. His farming venture was a successful one and produced bountiful crops. His diversification of crops and stock instead of a reliance on cotton agriculture had much to do with his success. Just prior to the time of his death, Franks had expanded his landholdings,

which added to his assets. When compared with his peers, "in 1860, approximately 70% of the Texas agricultural population was worth less than James Franks" (Perttula 1989b:164).

Using archeological data, Miller's (1980:3–4) pricing scale can be applied to the ceramic assemblage recovered to try to gain a better understanding of Franks's household economics. Perttula (1989b: 165) concludes that "the dominance of plates and cups, and the overall abundance of transfer-printed wares in the assemblage, seem to corroborate the archival records and tax rolls in that the James Franks farmstead represents a relatively affluent family in Hopkins County at the time of his death." Franks did relatively well for a yeoman farmer, but he still did not rank as high as a large planter or an urban merchant.

SYNTHESIS

While the historic archeological work at Cooper Lake yielded useful information on some topics, this body of data is limited in some ways. For example, only a few sites saw the kinds of extensive excavations needed to gain a full understanding of site layout and establish a reliable comparative data base, documentary research concerning land ownership and use histories was not done systematically, and the various lines of evidence available (i.e., archeological, documentary, and informant) were not integrated for many of the investigated sites. In addition, much of the work that was done concentrated on just a few parts of the project area (i.e., Cedar Creek, Granny's Neck/Pecan Grove, and Friendship), making it difficult to examine the history of Cooper Lake as a whole. Nonetheless, the data recovered are sufficient to construct a general narrative about how the project area developed during the 1800s and 1900s.

The history of the Cooper Lake area, at least as it is represented in the archeological record, begins with the immigration and settlement of Anglo-American families, some of whom brought African American slaves, onto the frontier in the 1840s–1850s. While the activities of the historic Caddo, immigrant Native Americans, and the Spanish and French were vitally important in the broad scope of the history of the region, they do not figure into this narrative because there are no known sites that can be related to these groups. Equally important was Texas's relationship with the Mexican nation, but all of the historic sites at Cooper Lake postdate the Texas Republic era.

The early settlement of the Cooper Lake area can be traced in part to the bold settlement ventures into Texas, such as those set forth by Stephen F. Austin in 1823, which firmly rooted the Anglo-American presence that was to become permanent with the Texas Revolution in 1836. Further, once admitted to the Union in 1845, a new kind of stability was established and immigration into Texas grew rapidly. Prospective settlers were drawn from abroad as well as from other established states. For instance, in 1849, a group of independent British gentlemen sent a representative to scout Texas with a settlement scheme in mind. He presented his results with the hopes "that it may be of service to the thousands of our fellow countrymen, who annually seek distant lands; and entrust their lives, families, property, and future efforts, to the care of strangers" (Smith 1849 [1969]:31). As a result of his report, 100 British settlers made the trip to Texas in 1850.

One early community in the project area was Cedar Creek (see Figure 43). Although it is difficult to define exactly when a community can be considered as functional, several of the farmers associated with antebellum sites in the Cooper Lake area appear to have had dealings with one another as documented in the primary sources, and for the purposes of this discussion, that will be a sufficient definition of community on the Texas frontier. "'Community' is defined as a grouping of individuals whose membership is based on locality, performing five major functions relevant to a locality. These functions are production/distribution/consumption; socialization; social control; social participation; and mutual support" (Green et al. 1996:45). It is difficult to tell to what extent the individuals at Cedar Creek in the antebellum period participated in all of the activities listed above, but it is fair to state that these individuals did relate to each other since their social sphere was somewhat limited. For example, Z. Dawson (of 41DT118) witnessed James Franks's (of 41DT97) will, and Robert Hannah (of 41DT126) was one of the appraisers of Franks's estate. These people, along with others who do not appear in the archeological record, constituted the Cedar Creek community in the antebellum period.

The existing information with reference to early community development in Hopkins County and the

area that was to become Delta County in 1870 is generally sketchy and sometimes contradictory. In addition to the archeological data from Cedar Creek, "oral historical information indicates that there was a cotton gin and grist mill on the J. Casber Survey at that time as well as a schoolhouse in the northeast corner of the Ziphania Dawson survey which was called the 'Daisy Mission'" (Perttula 1989b:10). Another source substantiates the story of Daisy Mission, with an informant describing the schoolhouse as having been "built there in the 1840s. It was a log pen structure with a mudcat chimney and sod chinking" (Lebo 1988:10). However, according to the same source, the cotton gin and gristmill were not established until the 1870s. Other sources indicate 1858–1860 for the cotton gin (Parish and Perttula 1988:302), with informant data concurring with the assignment of community status for Cedar Creek in the antebellum period (Parish and Perttula 1988:224).

The farmstead at the James Franks site, 41DT97, is the best case study that can be used to understand the antebellum Cedar Creek settlement. As mentioned above, James Franks was a landowning slaveholder. The nature of his utilization of the labor of his two slaves was brought into question by the researchers at the site (Perttula 1989b); however, it would not have been unusual for Franks to use his slaves on his own 433 acres as well as putting them out as "hired slaves" (Stampp 1956:185). Franks, who was from Illinois, employed mixed crop production, growing wheat, rye, and corn, with no cotton recorded as being in cultivation on his land. This was a common strategy for farmers from the Upper South and Midwest, who tended not to rely on a single cash crop, as was more common to Lower South farms.

The influx of planters and slave labor onto the rich Texas farmland in the mid nineteenth century led to an agricultural boom, whereas in the older sections of the South the heyday of this sort of agricultural system had long since passed. "Only in the Mississippi delta, the Louisiana bayous, the Red River and Arkansas River valleys, and the Texas prairies were men still earning fabulous profits during the 1850's" (Stampp 1956:408). Franks certainly was not incredibly wealthy, but the primary documents, especially Franks's will and probate inventory, and the household material culture, particularly the ceramics, seem to indicate at least moderate prosperity.

For example, in 1850 and 1860 only 33 and 36 percent of the farmers in "Region I, eastern Texas, consisting of thirty-six hilly upland counties covered with mixed forests" (Lowe and Campbell 1987:27) owned both land and slaves, as did Franks (Campbell and Lowe 1977:67). In the antebellum period, it actually was common for farmers to own land but not slaves. "Nearly three-fourths of all free Southerners had no connection with slavery through either family ties or direct ownership. The 'typical' Southerner was not only a small farmer but also a nonslaveholder" (Stampp 1956:30).

The land itself was another vital issue. As discussed previously, some of Franks's land had been acquired just before his death and therefore most probably had not been utilized to the same extent as his older holdings. The real usefulness of land came with "improvement," that is "land cleared and used for grazing, grass, or tillage, or which is now fallow, connected with or belonging to the farm" (Campbell and Lowe 1977:70). Unfortunately in the case of James Franks, his acreage was enumerated only as totals and was not divided into improved and unimproved land.

However, Franks had at least as much improved land as was needed to produce the yields of corn (200 bushels), wheat (440 bushels), and rye (50 bushels) that were inventoried for his estate. According to Smith (1849 [1969]:43–44), who traveled through northeast Texas in 1849, corn "yield varies from twenty-five to fifty bushels per acre," which would mean Franks had between 4 and 8 acres in corn. Also according to Smith, "the wheat district is on the prairies of Hopkins county where the soil is close," and it typically yielded "fifteen to thirty bushels" per acre. Thus, Franks would have had between 15 and 29 acres cultivated in wheat. At the very least, Franks had between 19 and 37 acres dedicated to those two crops. An estimation of the acreage that Franks had planted in rye is not possible, since Smith (1849 [1969]:44) commented only that "rye is said to grow well, but we did not see any." Taking into consideration the time variables, it probably is fair to say that these are conservative estimates of improved acreage. Franks also would have had pasturage for his eight yoke of oxen, and with his ownership of six log chains, it is likely that he cleared the timber from more than just 37 of his 433 acres.

Even with a minimum amount of 19 to 37 acres of improved land, Franks would have ranked with

the majority of the slaveholding farmers in Texas in 1850, 54 percent of whom had fewer than 50 acres of improved land. Using the figures for 1860, he would have ranked somewhat lower, since 68 percent of the slaveholding farmers had more than 50 acres of improved land (Campbell and Lowe 1977:71). If Franks's corn production alone is examined, his 200 bushels places him within the lower 23–24 percent of the Texas slaveholders who produced corn in 1850 and 1860 (Campbell and Lowe 1977:78). Another factor upon which to figure Franks's standing is the value of his livestock. His total livestock value of $600, based on 8 yoke of oxen valued at $400 and 100 hogs valued at $200, was about average for slaveholders in Texas in 1850, as 43 percent had stock valued at less than $500 and 28 percent had stock valued at more than $1,000. Using the figures for 1860, he was in the lower half of the ranking, with 22 percent having stock valued at less than $500 and 55 percent having more than $1,000 worth of livestock (Campbell and Lowe 1977:76).

Another early farmstead (41DT126) in this part of the project area was that of Robert Hannah. Technically, it belonged to the Granny's Neck/Pecan Grove community because of its geographic location south of Doctors Creek and north of the South Sulphur River (Moir et al. 1989:11-11). But the Cedar Creek community lay just north of Doctors Creek, and Hannah's residence was not far from that of Franks. The most telling bit of evidence, as mentioned above, is that Robert Hannah participated as an appraiser for the James Franks estate. If community is defined primarily by association, then Robert Hannah probably was as viable a member of the Cedar Creek community as any of the people actually living there.

While the area of Delta and Hopkins Counties had excellent farmland, it was not perfectly suited to the cultivation of cotton during the antebellum period. "The inland proximity of East Texas was less conducive to the plantation-cotton production economy, and as a result, this attracted more yeoman type farmers as opposed to cotton plantation farmers" (Winchell et al. 1992:12). That was true of James Franks, and it would be a fair assumption that other early settlers, such as Robert Hannah, John C. Wright (who lived at 41DT113 in the Cedar Creek community), and Zephriah Dawson, engaged in similar endeavors. The Dawsons were long-standing members of the Cedar Creek community, with site 41DT118 representing the original homeplace of Zephriah Dawson and his wife Asenith. Dawson held 320 acres, which he presumably farmed. Dawson and his wife were originally from Pennsylvania, had lived for a while in Illinois where many of their six children were born, and then immigrated to Texas as a family. Based on where he was from, Dawson probably would have been most familiar with mixed crop farming.

In time, the Dawson settlement expanded. By 1880, there were two houses on the land, the second having been built by the oldest son, John. Additional occupation was recorded at a third locality, 41DT120, which was occupied predominantly during the period 1925–1945 and was associated with Carl V. Dawson, Zephriah Dawson's grandson.

The other lasting contribution of the Dawson family to the community of Cedar Creek was the Dawson Cemetery, 41DT102. While the oldest dated headstone observed when the site was initially recorded was that of T. J. Taylor who died in 1875, Perttula (1988:83) concluded that it "began as a family cemetery in 1871." Several pieces of evidence suggest that the cemetery was established by the Dawson family upon the death of Zephriah. First, the cemetery was located very near the original Dawson homestead. Second, Zephriah's wife was listed as a widow in an 1880 survey, implying that Zephriah had died by that time. And third, the cemetery always has been associated with the Dawson name, suggesting that a Dawson was the first to be interred there, with the family cemetery developing into a community cemetery over time. That first grave could have been marked with a simple wood header that did not survive, or Zephriah's grave may have had a stone marker that has since disappeared, or the grave simply may have been unmarked.

Another cemetery associated with the Cedar Creek community, the Tucker Cemetery (41DT104), was founded by the family of Solomon T. Tucker in the 1880s and used until 1942 as a family plot. An informant, Mrs. Van (Buna) George who was born in 1912, reported "an old Indian, Sol Tucker made that graveyard. That's mama's kin folks . . ." (Parish and Perttula 1988:265). Positive evidence of Tucker's Indian heritage was not found when his marked grave was excavated during the cemetery relocation efforts, since he wore dentures and his teeth, where racial indicators would have been present, were missing. Further, the researchers

observed that it was "interesting to note . . . [the] lack of ear rings or nose ring which, according to informants, were worn by Solomon Tucker" (Lebo 1988:72). All of the observed funerary aspects and associated material culture would seem to indicate an Anglo burial. Assuming that the informant data as to Tucker's heritage are correct, his apparent integration into the community has interesting implications about race relations in the area. There seems to have been little or no discrimination against the Tuckers or their descendants on the basis of their Indian heritage. However, within the same community, there was a great deal of racism against African Americans. Fear and dislike of blacks was deeply entrenched in the antebellum period. For example, Texas was a major center for slave insurrections, and this only served to heighten racial tensions (Stampp 1956:138). Such attitudes typically were transmitted over time. The same informant cited above, Mrs. George, said of her father, "Papa don't cotton nigger" (Parish and Perttula 1988:258), and this seems to reflect a common attitude in northeast Texas during the nineteenth and twentieth centuries. Perhaps Solomon Tucker was accepted due to the degree of his acculturation. Such acculturation within established settlements rendered Native Americans "harmless" in Anglo eyes. Since Native Americans had been removed from the region well before the late 1800s, whites in the Cooper Lake area probably had begun to view Indians as "no longer the exotic natives met in the new Eden. They were being reduced to a symbol of the past" (Sobel 1987:91).

Little is known archeologically about the community of Granny's Neck/Pecan Grove which was located not far south of Cedar Creek. Most of what is known about this area was gleaned from archival sources and informant interviews, and the stories passed on orally concerning Granny's Neck/Pecan Grove are as much folklore as historical fact. The basic story of Granny's Neck/Pecan Grove is that "it was a settlement comprised primarily of saloons on a peninsula or neck of high ground" (Lebo 1988:10). Reportedly, a widow named Sinclair, her son, and a slave squatted on a piece of land on the Old Bonham to Jefferson Road where they operated a roadhouse on one side of the river, complementing Andy Campbell's establishment on the other side. These two saloons were "connected by a toll bridge called De Spain's Bridge, which was built on the Bohnam to Jefferson Road, across the South Sulphur in 1845, and in 1865 it was replaced by the Harper's Toll Bridge" (Lebo 1988:10). Although this is a colorful and interesting story, it was not possible to substantiate it entirely through the documentary evidence, and no archeological data were recovered that could shed light on the early development of Granny's Neck/Pecan Grove.

Besides the work at Robert Hannah's farmstead, the only other in-depth research conducted for Granny's Neck/Pecan Grove was at 41DT105, the Sinclair Cemetery. For obvious reasons, this work documents the ways of death more than the ways of life. The burials cover the period 1850–1880, thus spanning the era both before and after the Civil War. The one constant across the burial population is the generally poor health and repeated episodes of stress (such as malnutrition and disease) indicated in the skeletal remains. The burials themselves were associated with scant material culture, indicating that minimal expense was invested in interment. Most of the burials predate the coming of the railroad to Hopkins County and thus represent a more isolated and less prosperous time for settlers there. This population easily could be characterized as poor subsistence farmers. Another important contribution of the Sinclair Cemetery project is that it highlights the folklore quality of some of the informant data about Granny's Neck/Pecan Grove. Specifically, the archeological investigations there allow a strong case to be made that the Sinclair Cemetery was, in fact, not the final resting place of the Sinclair family.

Cedar Creek and Granny's Neck/Pecan Grove are the best-known antebellum communities at Cooper Lake, but they are not the only localities where early settlers lived. For example, the community of Addran on the south side of the valley was settled as early as the 1850s (Webb 1952:I:7), and one nearby site that is known from test excavations (41HP152) yielded artifacts indicating continuous use from ca. 1840 through 1940. Site 41HP152 may have been used first as the homestead of George W. Harper or a related family, but many subsequent house sites were located on "Harpers Hill" making it difficult to recover useful data about the pre–Civil War period.

While cotton was an important crop for Texas as a whole in the antebellum period, it was not widely produced in the Cooper Lake area. Therefore, Hopkins County did not make as significant a contribution to the war effort in the form of agricultural production as did many other counties. With

the end of the war and normalization of activities in the South, Hopkins (and later Delta) Counties joined into more-mainstream economic activities. The development of the railroad system was the key to market access.

> Overall, Blackland Prairie farmers were originally subsistence farmers who produced grain. With the collapse of the southern plantation system and its river transport infrastructure, followed by the emergence of the northern industrial railway network, however, these grain producing farmers suddenly found themselves in an economic vacuum. Within a short period of time, "wheat and corn fields were quickly converted to cotton." As the new inland cotton economy grew, tenant farming became a way of life for many families in East Texas [Winchell et al. 1992:13].

In fact, when Cedar Creek was at its peak, it consisted primarily of tenant farmers. Informant interviews concerning lifeways in that community during the late nineteenth and early twentieth centuries reiterate that point again and again. Austin Brantley, born in 1911 observed, "They farmed for a living, all of them" (Parish and Perttula 1988:242). Several such sites were investigated archeologically, for example 41DT91 (dating ca. 1880–1930 and occupied either by W. Tharp or Faulkner), 41DT119 (dating the late nineteenth–early twentieth century and possibly occupied by Quinton Miller), 41DT88 (dating ca. 1915–1960 and occupied by J. E. or Emmet Grant), and 41DT59 (dating ca. 1920–1940 occupied by unknown tenants). But serial occupancy and the fact that they tended to be occupied well into the twentieth century made it hard to recover useful data.

Based on general trends, though, all of these sites probably were farms from which a subsistence living was gained, with the cash crop of cotton providing the primary income. Commenting on life in the 1900s, Mrs. Van (Buna) George recalled,

> they were still raising cotton there. They raised a little corn for the meal that you ground or for the hogs or for the stock but usually it was cotton because it paid your debts, what you borrowed at the bank. You had to pay them back and that's the way people paid them back, cotton. Well we were poor, but everybody was poor, but we didn't know it. Course we raised our own food, raised our hogs, had our chickens, had our cows, had our vegetable garden of course. We canned everything [Parish and Perttula 1988:248].

This probably is a good general description of life on farms from that period in the Cedar Creek area.

Since Granny's Neck/Pecan Grove was just across Doctors Creek from Cedar Creek, it is reasonable to assume a certain degree of similarity between the two in terms of lifeways. As cited in the case of Robert Hannah's farmstead above, socialization crossed natural and town boundaries. As both communities grew and populations increased, social exchange probably increased as well. For example, informant Thomas Taylor, born in 1891, reported, "Cedar Creek and Granny's Neck and Liberty Grove, Us boys in Liberty Grove use to go to Granny's Neck and Cedar Creek and they come to Liberty Grove and play ball" (Parish and Perttula 1988:160). This type of socialization probably existed throughout all the communities within the Cooper Lake project area.

More evidence on the make-up of the Granny's Neck/Pecan Grove community was gathered for the postbellum period than for the period of initial settlement. Two of the tested sites, the John T. Talley Homestead (41DT107) and the John B. Talley Homestead (41DT121), date to this interval. According to archival information, the original settler, John T. Talley, occupied 41DT107 from 1888 until 1940. Several of his children subsequently established residences of their own on adjacent or nearby lands: John B. at 41DT121, Charles W. at 41DT120, and Phoebia A. at 41DT126. As with many immigrants to the area, John T. Talley was from the Upper South state of Tennessee. Informants reported that he built "a large L shaped frame dog trot" (Moir et al. 1989:4-3), and this house and his 1895 barn are documented in a period photograph. Informant Maggie Banks, born in 1903, also reported that "John Tally owned the saw mill in Granny's Neck" (Parish and Perttula 1988:185). Presumably she was referring to John B. since other informants tell of John T. having to go to Jefferson to get lumber to build his barn.

One of the postbellum communities at Cooper Lake, the African American settlement of Friendship, was investigated through archeological testing at

three sites (41DT192, 41DT208, and 41DT249) and detailed, community-oriented archival and informant research. "Friendship began in the late 1870s when a few African-Americans purchased property from the descendants of the original settlers of the area" (Green et al. 1996:27). In a period when many residents of the area, white and black alike, were tenants and increasingly few were landowners, the ownership of land by these black families is particularly notable. In this study, Green et al. (1996:36) conclude that, because many of the original settlers in Delta and Hopkins Counties were from the Upper South or Midwest where slavery was not prevalent, there was a good deal of racial tolerance on the part of those who settled the nearby white community of Klondike. Slavery originally was viewed as fundamentally an economic necessity, however, and was not based exclusively on racist attitudes. In time, the attitude that blacks were racially inferior became a justification and rationalization for their continued enslavement to maintain a labor force in light of rising moral and religious misgivings about slavery as an institution (Morgan 1975). As racist attitudes became entrenched in American thought, both North and South, "The white male wielders of power ensured their continued dominance in part by making certain that race replaced enslavement as the primary determinant of Afro-Americans' status" (Norton et al. 1988:106). Therefore, the Upper South immigrants of the 1840s may have had less involvement with slavery in comparison to their Lower South counterparts because of a regional difference in the type of crop production and labor needs, but this does not necessarily mean that the attitudes toward blacks were different. Their level of tolerance probably was no more than that of any other Southerner at the time.

Friendship was founded in the 1870s, i.e., during radical Reconstruction, when blacks were afforded by law new freedoms and rights (Litwack et al. 1987:396). That fact, perhaps combined with the opportunity for economic gain, might be a more likely explanation for the willingness of whites in Klondike to sell land to a few blacks in Friendship. Those advances enforced by the government during Reconstruction were rapidly eroded as old ways and old ideas resurfaced. "Where southern custom and etiquette had previously set the races apart, in the 1890s and early 1900s the Jim Crow laws made segregation even more systematic and extensive" (Litwack et al. 1987:398). And despite the fact that little racial strife was reported by informants between Klondike and Friendship, actions speak louder than words. Where racist sentiment was politely silenced, separatist beliefs were abundantly evident in the cultural landscape.

> The African-American farming community that was established three miles to the southeast of Klondike patronized the businesses in Klondike and considered themselves citizens of that town. . . . The African-Americans supported their own church, school, and social institutions but shared in the economic activities at Klondike through their cotton farming and as employees of Klondike residents [Green et al. 1996:33].

Blacks and whites did not live together, and for all purposes, they had their own towns. No amount of real integration was in operation. All social activity and community interaction was conducted on a separate basis, and all of the ways in which people came together to form a collective identity, such as through school or church, were divided into white or black. The Anglo residents of Klondike owned and operated all of the businesses and therefore had exclusive access to means of economic growth. The one exception was the small, short-term business venture by John Derrick at 41DT192, which resulted in the loss of his land. Besides cotton farming, African Americans served only as employees of whites in Klondike.

The Addran community on the southeast side of the Cooper Lake project area also was occupied during the postbellum era. It received little study, but several sites there were tested. One of these is 41HP143, the Lodwig Vaden site. The archeological evidence documents occupation from ca. 1870 to 1940, although the archival information mentions the Vaden family as landowners in Hopkins County as early as 1847. A farmstead such as 41HP143 most likely followed the rising and falling fortunes of the cotton industry. In the earlier period, ca. 1870, the Vaden farmstead probably produced both cotton and food crops, with an increase in the predominance of cotton as a cash crop as the nineteenth century progressed. The early twentieth century would have brought the trials of the boll weevil, followed in turn by the Great Depression and the crash of the cotton market. Whereas farmers in Delta County were able to revive their cotton economy after the Depression, Hopkins County slowly moved toward

dairying as a main source of income for the largely rural population.

One other site in the area of the Addran community, 41HP142, also may have been associated with the Vadens. The land was owned by the Lodwig Vaden family from 1856 to 1884, and the artifactual materials recovered date to the 1870s–1880s. Since the main Vaden residence was associated with another location, the farmstead at 41HP142 may have been rented to tenants. Judging from informant descriptions of the tenant lifestyle (Parish and Perttula 1988), it seems that tenants were not necessarily itinerant in nature. Instead, they were simply nonlandowning members of the community. They moved periodically but not incessantly. At this tenant site, "The small volume of material supports the contention that actual occupation may have been less than 5 years" (Moir et al. 1989:15-4). The individuals in residence at this site could have been family members (since many of the Vadens came to Texas) or familial friends.

As mentioned, the predominance of cotton farming and the tenant system in Texas was "dealt another blow in about 1900 when the boll weevil devastated cotton crops" (Freeman 1990:380). The Great Depression also served to eliminate cotton as an exclusive means of making a living (Winchell et al. 1992:13–14). Both of these events were crises across the whole of Texas. Emma Tiller, a west Texas tenant farm family member recalled the downfall:

> Her father had a small farm in western Texas. The first depression she recalls began in 1914. "We were almost starvin' to death. Papa had some very rich land, but those worms came like showers. The cotton was huge, you never seen nothin' like it. You could just sit in the house and hear the worms eatin' that cotton." [And by] "1929, me and my husband were sharecroppers. We made a crop that year, the owner takin' all of the crop" [Terkel 1970:232].

These kinds of conditions forced both Delta and Hopkins Counties to diversify their economies, with the two areas subsequently pursuing different trajectories. "Delta County continued its production of cotton, while Hopkins County developed a dairy industry" (Doehner et al. 1978:20).

Although not pursued during the studies at Cooper Lake, the twentieth-century development of the dairy industry in Hopkins County might be observable archeologically at sites such as 41HP152 west of Addran. As noted above, Harpers Hill was settled as early as the 1840s, but it also contains the remains of perhaps four tenant houses dating ca. 1910–1940. These might be characterized by spatial layouts and material culture assemblages relating to livestock raising and utilization. For example, outbuildings could be oriented to accommodate dairy cattle, such as milking barns, and the artifact assemblage would be more likely to exhibit utilitarian stonewares, such as butter churns and crocks, or even large metal milk cans, used in the production and storage of dairy products.

Informants Jewel (born in 1906) and Austin (born in 1911) Brantley, described that sort of small-scale, tenant dairy operation. Austin recalled, "I had nine milk cows and I milked and shipped milk all the time you see and I'd sell milk in Cooper. I sell over a hundred quarts of milk in Cooper every morning. . . . See I was milking lots of cows and I had a milk barn right out there." Jewel added, "I'd churn and we'd peddle butter and butter milk, sweet milk . . . a lot of people down in there had milk" (Parish and Perttula 1988:243).

In spite of the limitations in the historical data recovered during the Cooper Lake project, some positive contributions were made. Enough information was retrieved to allow the overall story of historical settlement and development to be told, and more-specific data were obtained about particular localities or topics. Most important among the latter are the following: (1) the archeological and archival research at the James Franks site, which contributed valuable data about early settlement of the area; (2) the community-based research done for the John Derrick, John Hancock, and Wallace Carter sites, which gave a glimpse into what life was like for African Americans who settled in the Friendship community in the late nineteenth and early twentieth centuries; (3) the research done on the Sinclair Cemetery, which provided insights into health and mortuary behavior for a segment of the Anglo-American population during the post–Civil War era; and (4) the oral history research, which added a personal element to the sometimes dry archeological data.

REFERENCES CITED

Albert, Lois E.
1981 *Ferndale Bog and Natural Lake: Five Thousand Years of Environmental Change in Southeast Oklahoma.* Studies on Oklahoma's Past, No. 7. Oklahoma Archeological Survey, Norman.

Bailey, Gail L., Douglas K. Boyd, and C. Britt Bousman
1991 *Archeological Survey of the City Lakes Area and Geomorphological and Magnetometer Surveys, Cooper Lake Project, Delta and Hopkins Counties, Texas.* Technical Reports No. 11. Prewitt and Associates, Inc., Austin.

Barnes, Virgil E. (project director)
1966 *Geologic Atlas of Texas, Texarkana Sheet.* Bureau of Economic Geology, The University of Texas at Austin.

Blair, W. Frank
1950 The Biotic Provinces of Texas. *Texas Journal of Science* 2(1):93–117.

Blake, Leonard
1994 Analysis of Rowland Clark Site Corn. *Journal of Northeast Texas Archaeology* 4:43–49.

Bohlin, Jeffery
1993 Informant and Avocational Collectors Interviews. In *Archaeological Survey of Cooper Lake, Delivery Order Number 7, 1989*, by David H. Jurney, Jeffery Bohlin, Sue E. Linder-Linsley, S. Christopher Caran, and David R. Pedler, pp. 9-1 through 9-11. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

Bousman, C. Britt
1986 *An Archeological Survey of a Proposed Phillips 66 Natural Gas Company Pipeline, Hopkins County, Texas.* Letter Report 336. Prewitt and Associates, Inc., Austin.

1991 Paleoenvironments. In *Excavations at the Bottoms, Rena Branch, and Moccasin Springs Sites, Jewett Mine Project, Freestone and Leon Counties, Texas*, by Ross C. Fields, L. Wayne Klement, C. Britt Bousman, Steve A. Tomka, Eloise F. Gadus, and Margaret A. Howard, pp. 21–35. Reports of Investigations No. 82. Prewitt and Associates, Inc., Austin.

Bousman, C. Britt, Michael B. Collins, and Timothy K. Perttula
1988 *Quaternary Geomorphology at Cooper Basin: A Framework for Archeological Inquiry, Delta and Hopkins Counties, Texas.* Reports of Investigations No. 55. Prewitt and Associates, Inc., Austin.

Brewington, Robbie L., John E. Dockall, and Harry J. Shafer
1995 *Archaeology of 41MX5: A Late Prehistoric Caddoan Hamlet in Morris County, Texas.* Reports of Investigations No. 1. Texas A&M University, College Station.

Bruseth, James E., Larry D. Banks, William A. Martin, Daniel J. Prikryl, and Timothy K. Perttula
1992 The 1992 Field School: Soggy but Successful. *Texas Archeology* (Newsletter of the Texas Archeological Society) 36(3):1, 7–13.

Bruseth, James E., Nancy A. Kenmotsu, William A. Martin, Daniel J. Prikryl, Timothy K. Perttula, Jacque Jacquier, and Larry D. Banks
1991 Summary of the 1991 Field School in Red River County, Texas. *Texas Archeology* (Newsletter of the Texas Archeological Society) 35(3):1, 6–10.

Bruseth, James E., and Timothy K. Perttula
1981 *Prehistoric Settlement Patterns at Lake Fork Reservoir*. Texas Antiquities Permit Series Report No. 2. Texas Antiquities Committee, Austin, and Southern Methodist University, Dallas.

Bruseth, James E., Mark Raab, and Daniel E. McGregor
1987 Late Holocene Paleoecology of the Prairie Margin of Texas. In *Introduction to the Richland Creek Archaeological Project: Environmental Background and Cultural Setting*, edited by James E. Bruseth and Randall W. Moir, pp. 29–47. Richland Creek Technical Series, Volume I. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

Bryant, Vaughn M., Jr., and Richard G. Holloway
1985 A Late Quaternary Paleoenvironmental Record of Texas: An Overview of the Pollen Evidence. In *Pollen Records of Late Quaternary North American Sediments*, edited by Vaughn M. Bryan, Jr., and Richard G. Holloway, pp. 39–70. American Association of Stratigraphic Palynologists Foundation, Dallas.

Burnett, Barbara A.
1990 The Bioarcheological Synthesis of the Eastern Portions of the Gulf Coastal Plain. In *The Archeology and Bioarcheology of the Gulf Coastal Plain*, by Dee Ann Story, Janice A. Guy, Barbara A. Burnett, Martha Doty Freeman, Jerome C. Rose, D. Gentry Steele, Ben W. Olive, and Karl J. Reinhard, pp. 385–418. Research Series No. 38. Arkansas Archeological Survey, Fayetteville.

Byrd, Clifford Leon
1971 *Origin and History of the Uvalde Gravel of Central Texas*. Baylor Geological Studies Bulletin No. 20. Baylor University Press, Waco.

Campbell, Randolph B., and Richard G. Lowe
1977 *Wealth and Power in Antebellum Texas*. Texas A&M University Press, College Station.

Cliff, Maynard B.
1989 Archaeological Investigations at the Thomas Site (41DT80). In *Archaeological Investigations at Cooper Lake: 1987 Season* (review draft), by Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators, pp. 6-1 through 6-145. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

1994 *Cultural Resources Survey of a Portion of the White Oak Creek Mitigation Area (WOCMA), Bowie, Cass, and Morris Counties, Texas: 1990–1992*. White Oak Creek Mitigation Area Archeological Technical Series, Report of Investigations No. 2. Geo-Marine, Inc., Plano, Texas.

Cliff, Maynard B., Melissa M. Green, Steven M. Hunt, and David Shanabrook
1995 *Archeological Test Excavations at Two Prehistoric Sites (41DT59 and 41DT247) at Cooper Lake, Delta County, Texas, 1994*. Miscellaneous Report of Investigations No. 90. Geo-Marine, Inc., Plano, Texas.

Cliff, Maynard B., Melissa Green, Steven M. Hunt, David Shanabrook, and Duane E. Peter
1996 *Excavations in Area C of the Unionville Site (41CS151), White Oak Creek Mitigation Area (WOCMA), Cass County, Texas*. White Oak Creek Mitigation Area Archeological Technical Series No. 4. Geo-Marine, Inc., Plano, Texas.

Cliff, Maynard B., and Steven M. Hunt
1995 *Cultural Resources Testing of Three Sites within the Moist Soils Management Area (MSMA) of the White Oak Creek Mitigation Area (WOCMA), Cass County, Texas: 1992*. White Oak Creek Mitigation Area Archeological Technical Series No. 3. Geo-Marine, Inc., Plano, Texas.

Collins, Michael B., and C. Britt Bousman
1990 Cultural Implication of Late Quaternary Environmental Change in Northeast Texas. Ms. on file, Texas Historical Commission, Austin.

Crane, Cathy J.
1993 Archaeobotanical Analysis. In *Archaeological Survey of Cooper Lake, Delivery Order No. 7, 1989*, by David H. Jurney, Jeffery Bohlin, Sue E. Linder-Linsley, S. Christopher Caran, and David R. Pedler, pp. D-1 through D-8. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

Darwin, Robert L., C. Reid Ferring, and Brooks B. Ellwood
1990 Geoelectric Stratigraphy and Subsurface

Evaluation of Quaternary Stream Sediments at the Cooper Basin, Northeast Texas. *Geoarchaeology* 5(1):53–79.

Diamond, David D., David H. Riskind, and Steve L. Orzell
1987 A Framework for Plant Community Classification and Conservation in Texas. *The Texas Journal of Science* 39(3):203–221.

Doehner, Karen, and Richard E. Larson
1978 *Archaeological Research at the Proposed Cooper Lake, Northeast Texas, 1974–1975.* Research Report 108. Archaeology Research Program, Southern Methodist University, Dallas.

Doehner, Karen, Duane Peter, and S. Alan Skinner
1978 *Evaluation of the Archaeology of the Proposed Cooper Lake.* Research Report 114. Archaeology Research Program, Southern Methodist University, Dallas.

Duffield, Lathel F.
1959 *Archeological Reconnaissance at Cooper Reservoir, Delta and Hopkins Counties, Texas.* Report submitted to the U.S. National Park Service by the Texas Archeological Salvage Project, The University of Texas at Austin.

Fenneman, Nevin M.
1938 *Physiography of Eastern United States.* McGraw-Hill, New York.

Ferring, C. Reid
1989 Geoarchaeological Investigations at Cooper Lake. In *Archaeological Investigations at Cooper Lake: 1987 Season* (review draft), by Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators, pp. E-1 through E-34. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

Ferring, C. Reid (editor)
1982 *The Late Holocene Prehistory of Delaware Canyon, Oklahoma.* Contributions in Archaeology No. 1. Institute of Applied Sciences, North Texas State University, Denton.

Fields, Ross C.
1996 The Archeology of the Post Oak Savannah of East-Central Texas. *Bulletin of the Texas Archeological Society* 66:301–330.

Fields, Ross C., Douglas K. Boyd, C. Britt Bousman, and Jerrilyn B. McLerran
1991 *Review of Cultural Resources Investigations at Cooper Lake, Delta and Hopkins Counties, Texas.* Prewitt and Associates, Inc., Austin.

Fields, Ross C., Eloise F. Gadus, L. Wayne Klement, C. Britt Bousman, and Jerrilyn B. McLerran
1993 *Excavations at the Tick, Spike, Johns Creek, and Peerless Bottoms Sites, Cooper Lake Project, Delta and Hopkins Counties, Texas.* Reports of Investigations No. 91. Prewitt and Associates, Inc., Austin.

Fields, Ross C., Eloise F. Gadus, L. Wayne Klement, and Karen M. Gardner
1994 *Excavations at the Spider Knoll Site, Cooper Lake Project, Delta County, Texas.* Reports of Investigations Number 96. Prewitt and Associates, Inc., Austin.

Fields, Ross C., and Karen M. Gardner
1991 Mitigation Plan for the Cooper Lake Project, Delta and Hopkins Counties, Texas. Submitted to the U.S. Army Corps of Engineers, Fort Worth District by Prewitt and Associates, Inc., Austin.

Fields, Ross C., and Colin Garvey
1986 *Archeological Monitoring of Portions of a Phillips 66 Natural Gas Company Pipeline, Hopkins County, Texas.* Letter Report No. 338. Prewitt and Associates, Inc., Austin.

Fields, Ross C., and Steve A. Tomka
1993 Hunter-Gatherer Mobility in Northeast Texas. In *Archeology in the Eastern Planning Region, Texas: A Planning Document*, edited by Nancy Adele Kenmotsu and Timothy K. Perttula, pp. 69–95. Department of Antiquities Protection Cultural Resource Management Report 3. Texas Historical Commission, Austin.

Freeman, Martha Doty
1990 Culture History of Europeans, Africans, and Their Descendants. In *The Archeology and Bioarcheology of the Gulf Coastal Plain: Volume 2*, by Dee Ann Story, Janice A. Guy, Barbara A. Burnett, Martha Doty Freeman, Jerome C. Rose, D. Gentry Steele, Ben W. Olive, and Karl J. Reinhard, pp. 367–384. Research Series No. 38. Arkansas Archeological Survey, Fayetteville.

Fullington, Richard
1989 Malacology. In *Archaeological Investigations at Cooper Lake: 1987 Season* (review draft), by Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators,

pp. H-1 through H-6. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

Gadus, Eloise F., Ross C. Fields, and C. Britt Bousman
1992 *Archeological Investigations at 41DT11, 41DT21, 41DT50, 41DT54, and 41DT63 at Cooper Lake, Delta County, Texas*. Reports of Investigations No. 86. Prewitt and Associates, Inc., Austin.

Gadus, Eloise F., Ross C. Fields, C. Britt Bousman, and Margaret A. Howard
1992 *Excavations at the Finley Fan Site, 41HP159, Hopkins County, Texas*. Reports of Investigations No. 78. Prewitt and Associates, Inc., Austin.

Gadus, Eloise F., Ross C. Fields, L. Wayne Klement, C. Britt Bousman, Margaret A. Howard, and Karen M. Gardner
1991 *Testing, Revisitation, and Evaluation of Selected Sites at Cooper Lake, Delta and Hopkins Counties, Texas*. Reports of Investigations No. 81. Prewitt and Associates, Inc., Austin.

Gilmore, Kathleen, and Norma Hoffrichter
1964 Preliminary Investigations of the L. O. Ray Site, Delta County, Texas. *The Record, Newsletter of the Dallas Archeological Society* 19(1):3–17.

Good, Carolyn E.
1982 Analysis of Structures, Burials, and Other Cultural Features. *The Deshazo Site, Nacogdoches County, Texas*. Texas Antiquities Permit Series No. 7(1):51–112.

Green, Melissa M.
1989 Archaeological Investigations on the Zephriah Dawson Site (41DT118). In *Archaeological Investigations at Cooper Lake: 1987 Season* (review draft), Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators, pp. 13-1 through 13-20. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

1995 Archaeological Investigations on 41DT126: The Robert Hannah Site. In *Archeological Investigations at Cooper Lake: 1987 Season* (later review draft), Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators, pp. 495–513. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

Green, Melissa M., and Randall W. Moir
1989 Archaeological Investigations at the John C. Wright Site (41DT113). In *Archeological Investigations at Cooper Lake: 1987 Season* (review draft), Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators, pp.12-1 through 12-16. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

Green, Melissa M., Duane E. Peter, and Donna K. Shepard
1996 *Friendship: An African-American Community on the Prairie Margin of Northeast Texas*. Miscellaneous Report of Investigations No. 81. Geo-Marine, Inc., Plano, Texas.

Hall, Stephen A.
1990 Channel Trenching and Climatic Change in the Southern U.S. Great Plains. *Geology* 18: 342–345.

Hall, Stephen A., and Christopher Lintz
1984 Buried Trees, Water Table Fluctuations, and 3000 Years of Changing Climate in West-Central Oklahoma. *Quaternary Research* 22:129–133.

Harmon, Anna M., and Jerome C. Rose
1989 Bioarcheology of the Louisiana and Arkansas Study Area. In *Archeology and Bioarcheology of the Lower Mississippi Valley and Trans-Mississippi South in Arkansas and Louisiana*, by Marvin D. Jeter, Jerome C. Rose, G. Ishmael Williams, Jr., and Anna M. Harmon, pp. 323–354. Research Series No. 37. Arkansas Archeological Survey, Fayetteville.

Harris, R. K.
1955 A Flexed Burial, Site 19C5-15, Delta County, Texas. *The Record, Newsletter of the Dallas Archeological Society* 14(2):8–10.

Hatzenbuehler, R.
1953 A Flexed Burial, Delta County, Texas. *The Record, Newsletter of the Dallas Archeological Society* 11(4):16–17.

Holloway, Richard G., L. Mark Raab, and Robert Stuckenrath
1987 Pollen Analysis of Late-Holocene Sediments from a Central Texas Bog. *The Texas Journal of Science* 39(1):71–79.

Hyatt, Robert D., Barbara H. Butler, and Herbert P. Mosca, III
1974 *Archaeological Research at Cooper Lake, 1970–1972.* Contributions in Anthropology No. 12. Southern Methodist University, Dallas.

Hyatt, Robert D., and Karen Doehner
1975 *Archaeological Research at Cooper Lake, Northeast Texas, 1973.* Contributions in Anthropology No. 15. Southern Methodist University, Dallas.

Hyatt, Robert D., and S. Alan Skinner
1971 *Archaeological Resources of the Cooper Reservoir, Texas.* Report submitted to the National Park Service by the Department of Anthropology, Southern Methodist University, Dallas.

Jelks, Edward B.
1961 *Excavations at Texarkana Reservoir, Sulphur River, Texas.* River Basin Surveys Papers No. 21, from Bureau of American Ethnology Bulletin 179. U.S. Government Printing Office, Washington, D.C.

Johnson, LeRoy, Jr.
1962 The Yarbrough and Miller Sites of Northeast Texas, with a Preliminary Definition of the La Harpe Aspect. *Bulletin of the Texas Archeological Society* 32:141–284.

1989 *Great Plains Interlopers in the Eastern Woodlands during Late Paleoindian Times.* Office of the State Archeologist Report 36. Texas Historical Commission, Austin.

Jurney, David H., and Jeffery Bohlin
1993 *Archaeological Survey of Cooper Lake, Delivery Order Number 6, 1989.* Archaeology Research Program, Department of Anthropology, Southern Methodist University, Dallas.

Jurney, David H., Jeffery Bohlin, Sue E. Linder-Linsley, S. Christopher Caran, and David R. Pedler
1993 *Archaeological Survey of Cooper Lake, Delivery Order Number 7, 1989.* Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

Jurney, David H., and Randall W. Moir (editors)
1987 *Historical Buildings, Material Culture, and People of the Prairie Margin: Architecture, Artifacts, and Synthesis of Historic Archaeology.* Richland Creek Technical Series, Vol. V. Archaeology Research Program, Southern Methodist University, Dallas.

Kelley, David B. (editor)
1994 *The McLelland and Joe Clark Sites: Protohistoric-Historic Caddoan Farmsteads in Southern Bossier Parish, Louisiana.* Coastal Environments, Inc., Baton Rouge, Louisiana.

Krieger, Alex D.
1946 *Culture Complexes and Chronology in Northern Texas.* University of Texas Publications No. 4640. Austin.

Lebo, Susan A.
1988 *An Archaeological and Bioarchaeological Perspective: The Tucker (41DT104) and Sinclair (41DT105) Cemeteries of Delta County, Texas.* Institute of Applied Sciences, The University of North Texas, Denton.

Litwack, Leon F., Winthrop D. Jordan, Richard Hofstadter, William Miller, and Daniel Aaron
1987 *The United States: Becoming A World Power, Vol. II.* Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

Lowe, Richard G., and Randolph B. Campbell
1987 *Planters & Plain Folk: Agriculture in Antebellum Texas.* Southern Methodist University Press, Dallas.

Mallouf, Robert J.
1976 *Archeological Investigations at Proposed Big Pine Lake, 1974–1975, Lamar and Red River Counties, Texas.* Archeological Survey Report 18. Texas Historical Commission, Austin.

Malone, James M., and Alton K. Briggs
1970 *An Archeological Survey of the Texarkana Reservoir Enlargement Area: Report on the First Season.* Archeological Survey Report No. 7. Texas Historical Survey Committee and Texas Water Development Board, Austin.

Martin, William A.
1989a Archaeological Investigations at the Doctors Creek Site (41DT124). In *Archaeological Investigations at Cooper Lake: 1987 Season* (review draft), by Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators, pp. 7-1 through 7-110. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

1989b Archaeological Investigations at the Lawson

Site (41HP78). In *Archaeological Investigations at Cooper Lake: 1987 Season* (review draft), by Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators, pp. 9-1 through 9-93. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

McGregor, Daniel E.
1989 Excavations at Site 41HP137. In *Archaeological Investigations at Cooper Lake: 1987 Season* (review draft), by Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators, pp. 8-1 through 8-28. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

McGregor, Daniel E., William A. Martin, and Maynard B. Cliff
1989 Site Descriptions of Tested Prehistoric Sites. In *Archaeological Investigations at Cooper Lake: 1987 Season* (review draft), Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators, pp. 3-1 through 3-124. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

McGregor, Daniel E., and Erwin Roemer
1989 Archeological Survey at Cooper Lake, Proposed Water Intake Easement for North Texas Municipal Water District, Hopkins County, Texas. Letter report prepared by the U.S. Army Corps of Engineers, Fort Worth District.

Miller, G. L.
1980 Classification and Economic Scaling of 19th Century Ceramics. *Historical Archaeology* 14:1–40.

Moir, Randall W., and David H. Jurney (Co-Principal Investigators)
1988 *A Research Design for Archaeological and Historical Investigations, Cooper Lake, Delta and Hopkins Counties, Texas.* Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

Moir, Randall W., Daniel E. McGregor, and David H. Jurney (Co-Principal Investigators)
1989 *Archaeological Investigations at Cooper Lake: 1987 Season* (review draft). Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

Moorman, Edward H., and E. B. Jelks
1952 *Appraisal of the Archeological Resources of the Cooper Reservoir, Delta and Hopkins Counties, Texas.* Report prepared by the River Basin Surveys, Smithsonian Institution, Washington, D.C.

Morgan, Edmund S.
1975 *American Slavery/American Freedom: The Ordeal of Colonial Virginia.* W. W. Norton & Company, New York.

Natural Fibers Information Center
1987 *The Climates of Texas Counties.* Bureau of Business Research in cooperation with the Office of the State Climatologist, Texas A&M University. The University of Texas at Austin.

Nelson, Bo, and Timothy K. Perttula
1993 The Z. V. Davis-McPeek Site, an Early Caddoan Mound Site in the Little Cypress Creek Valley, Upshur County, Texas. *Notes on Northeast Texas Archaeology* 2:50–65.

Norton, Mary Beth, David M. Katzman, Paul D. Escott, Howard P. Chudacoff, Thomas G. Paterson, William M. Tuttle, Jr., and William J. Brophy
1988 *A People and a Nation: A History of the United States, Brief Edition, Volume A: To 1877.* Houghton Mifflin Company, Boston.

Parish, C. K., and T. K. Perttula
1988 Oral Historical Interviews. Ms. on file, Institute of Applied Sciences, University of North Texas, Denton and Library of Congress, Washington, D.C.

Perino, Gregory
1981 *Archeological Investigations at the Roden Site (MC-215), McCurtain County, Oklahoma.* Potsherd Press Publication No. 1. Museum of the Red River, Idabel, Oklahoma.

1983 *Archaeological Research at the Bob Williams Site (41RR16), Red River County, Texas.* Potsherd Press, Museum of the Red River, Idabel, Oklahoma.

1994 Archaeological Research at the Rowland Clark Site (41RR77), Red River County, Texas. *Journal of Northeast Texas Archaeology* 4:3–42.

1995 The Dan Holdeman Site (41RR11), Red River County, Texas. *Journal of Northeast Texas Archaeology* 6:3–65.

Perttula, Timothy K.

1988 *Cultural Resources Survey at Cooper Lake, Delta and Hopkins Counties, Texas*. Institute of Applied Sciences, The University of North Texas, Denton.

1989a *Test Excavations at Three Late Nineteenth/ Early Twentieth Century Farmsteads at Cooper Lake, Delta and Hopkins Counties, Texas*. Contributions in Archaeology No. 8. Institute of Applied Sciences, The University of North Texas, Denton.

1989b *The James Franks Site (41DT97): Excavations at a Mid-Nineteenth Century Farmstead in the South Sulphur River Valley, Cooper Lake Project, Texas*. Contributions in Archaeology No. 7. Institute of Applied Sciences, The University of North Texas, Denton.

1990a *The Hurricane Hill Site (41HP106): Excavations at Cooper Lake, Hopkins County, Texas* (second draft). Contributions in Archaeology No. 9. Institute of Applied Sciences, University of North Texas, Denton.

1990b Historic Context: The Evolution of Agricultural Societies in Northeast Texas before A.D. 1600. Historic context funded by the Texas Historical Commission, Austin.

1992 *"The Caddo Nation": Archaeological and Ethnohistoric Perspectives*. University of Texas Press, Austin.

1994a Caddoan Mound Sites in the Sabine River Basin of Northeast Texas. *Caddoan Archeology Newsletter* IV(4):4–19.

1994b Additional Information on Caddoan Mound Sites in the Sabine River Basin of Northeast Texas. *Caddoan Archeology Newsletter* V(1):1–2.

1995 Early Ceramic Settlement in Northeast Texas: Archeological Investigations of the Hurricane Hill Site (41HP106), Cooper Lake. In *Advances in Texas Archeology: Contributions from Cultural Resource Management, Volume I*, edited by James E. Bruseth and Timothy K. Perttula, pp. 131–154. Cultural Resource Management Report 5. Department of Antiquities Protection, Texas Historical Commission, Austin.

Perttula, Timothy K. (compiler)

1993 Mound Sites in Northeast Texas and Northwest Louisiana. In *Archeology in the Eastern Planning Region, Texas: A Planning Document*, edited by Nancy Adele Kenmotsu and Timothy K. Perttula, pp. 251–252. Cultural Resource Management Report 3. Department of Antiquities Protection, Texas Historical Commission, Austin.

Perttula, Timothy K., and Bob D. Skiles

1988 41RA65, An Early Ceramic-Early Caddoan Period Site on Garrett Creek, Rains County, Texas. *The Record, Newsletter of the Dallas Archeological Society* 42(3):69–81.

Perttula, Timothy K., Bob D. Skiles, Michael B. Collins, Margaret C. Trachte, and Fred Valdez, Jr.

1986 *This Everlasting Sand Bed: Cultural Resources Investigations at the Texas Big Sandy Project, Wood and Upshur Counties, Texas*. Reports of Investigations No. 52. Prewitt and Associates, Inc., Austin.

Powell, J. D.

1965 *Paleontological Importance of the Cooper Reservoir Basin, Texas: Cretaceous and Tertiary*. Fondren Science Series 9. Southern Methodist University, Dallas.

Preston, N. E.

1972 Multiple Paleo Finds in Hunt County, Texas. *Missouri Archaeological Society Newsletter*, pp. 6–8.

Prewitt, Elton R.

1996 Distributions of Typed Projectile Points in Texas. *Bulletin of the Texas Archeological Society* 66:83–173.

Price, C. R.

1985 Patterns of Cultural Behavior and Intra-Site Distributions of Faunal Remains at the Widow Harris Site. *Historical Archaeology* 19:40–56.

Rainey, M.

1974 *The Quaternary Stratigraphy of the North Sulphur River*. Master's thesis, Southern Methodist University, Dallas.

Ressel, Dennis

1979 *Soil Survey of Lamar and Delta Counties, Texas*. United States Department of Agricul-

ture, Soil Conservation Service in cooperation with Texas Agricultural Experiment Station.

Rose, Jerome C., Michael P. Hoffman, Barbara A. Burnett, Anna M. Harmon, and James E. Barnes
n.d. Skeletal Biology of the Prehistoric Caddo. Ms. on file, Texas Historical Commission, Austin.

Schambach, Frank F.
1970 *Pre-Caddoan Cultures in the Trans-Mississippi South: A Beginning Sequence*. Ph.D. dissertation, Harvard University, Cambridge, Massachusetts.

1982a The Archeology of the Great Bend Region in Arkansas. In *Contributions to the Archeology of the Great Bend Region of the Red River Valley, Southwest Arkansas*, edited by F. F. Schambach and F. Rackerby, pp. 1–11. Research Series No. 22. Arkansas Archeological Survey, Fayetteville.

1982b An Outline of Fourche Maline Culture in Southwest Arkansas. In *Arkansas Archeology in Review*, edited by N. L. Trubowitz and M. D. Jeter, pp. 132–197. Research Series No. 15. Arkansas Archeological Survey, Fayetteville.

Schambach, Frank F., and Ann M. Early
1982 Southwest Arkansas. In *A State Plan for the Conservation of Archeological Resources in Arkansas*, edited by Hester A. Davis. Research Series 21. Arkansas Archeological Survey, Fayetteville.

Scurlock, J. Dan
1962 The Culpepper Site, A Late Fulton Aspect Site in Northeastern Texas. *Bulletin of the Texas Archeological Society* 32(for 1961): 285–316.

Skinner, S. Alan, R. King Harris, and Keith M. Anderson (editors)
1969 *Archaeological Investigations at the Sam Kaufman Site, Red River County, Texas*. Contributions in Anthropology No. 5. Southern Methodist University, Dallas.

Slaughter, Bob H.
1964 *Geological Survey and Appraisal of the Paleontological Resources of the Cooper Reservoir Basin, Delta and Hopkins Counties, Texas*. Fondren Science Series No. 6. Southern Methodist University, Dallas.

Slaughter, Bob H., and B. Reed Hoover
1963 Sulphur River Formation and the Pleistocene Mammals of the Ben Franklin Fauna. *Journal of the Graduate Research Center* 31(3):132–148. Southern Methodist University, Dallas.

Smith, E.
1849 Accounting of a Journey through Northeastern Texas Undertaken in 1849, for the Purpose of Immigration. Hamilton, Adams and Co., London. Reprinted in *East Texas Historical Journal* 7:28–49(1969), 8:29–91(1970).

Sobel, Mechal
1987 *The World They Made Together: Black and White Values in Eighteenth-Century Virginia*. Princeton University Press, Princeton.

Stampp, Kenneth M.
1956 *The Peculiar Institution: Slavery in the Ante-Bellum South*. New York, Random House.

Stephenson, Robert L.
1950 *Archeological Survey of Texarkana Reservoir, Bowie and Cass Counties, Texas*. River Basin Surveys, Smithsonian Institution, Washington, D.C.

Stewart-Abernathy, L. C.
1986 *The Moser Farmstead, Independent but not Isolated: The Archeology of a Late Nineteenth Century Ozark Farmstead*. Research Series No. 26, Arkansas Archeological Survey, Fayetteville.

Story, Dee Ann
1990 Cultural History of the Native Americans. In *The Archeology and Bioarcheology of the Gulf Coastal Plain*, by Dee Ann Story, Janice A. Guy, Barbara A. Burnett, Martha Doty Freeman, Jerome C. Rose, D. Gentry Steele, Ben W. Olive, and Karl J. Reinhard, pp. 163–366. Research Series No. 38. Arkansas Archeological Survey, Fayetteville.

Stuiver, Minze, and Paul R. Reimer
1993 *Handbook of Texas Archeology: Type Descriptions*. Texas Archeological Society Special Publication 1 and Texas Memorial Museum Bulletin 4. Austin.

Terkel, Studs
1970 *Hard Times: An Oral History of the Great Depression*. Random House, New York.

Texas Agricultural Extension Service
1980 *Know Your Grasses*. Cooperative Extension

Work in Agriculture and Home Economics, Texas A&M University in cooperation with the United States Department of Agriculture. Texas A&M University, College Station.

Tharp, Benjamin Carroll
1939 *The Vegetation of Texas.* Texas Academy Publications in Natural History, Texas Academy of Sciences. Anson Jones Press, Houston.

Thomas, Prentice Marquet, Jr., L. Janine Campbell, and Stephen R. Ahler
1980 The Hanna Site: An Alto Village in Red River Parish. *Bulletin of the Louisiana Archaeological Society* 5.

Thurmond, J. Peter
1981 *Archeology of the Cypress Creek Drainage Basin, Northeastern Texas and Northwestern Louisiana.* Master's thesis, The University of Texas at Austin.

1985 Late Caddoan Social Group Identifications and Sociopolitical Organization in the Upper Cypress Basin and Vicinity, Northeastern Texas. *Bulletin of the Texas Archeological Society* 54:185–200.

1988 Caddoan Archeology, Its Present Status and Future Directions: A Perspective from Northeast Texas. Paper presented at the 30th Caddo Conference, Dallas, Texas.

Trubowitz, Neal L. (editor)
1984 *Cedar Grove: An Interdisciplinary Investigation of a Late Caddo Farmstead in the Red River Valley.* Research Series No. 23. Arkansas Archeological Survey, Fayetteville.

Turner, Robert L., Jr.
1978 The Tuck Carpenter Site and Its Relation to Other Sites within the Titus Focus. *Bulletin of the Texas Archeological Society* 49:1–110.

1992 *Prehistoric Mortuary Remains at the Tuck Carpenter Site, Camp County, Texas.* Studies in Archeology 10. Texas Archeological Research Laboratory, The University of Texas at Austin.

Webb, Walter Prescott (editor-in-chief)
1952 *The Handbook of Texas.* Vols. I and II. Texas State Historical Association, Austin.

Wilson, Diane
1993 Dental Paleopathologies in the Sanders Site (41LR2) Population from Lamar County, Texas. *Journal of Northeast Texas Archaeology* 5:29–59.

Wilson, Diane, and Diane Cargill
1993 Stable Isotope Analysis from the Sanders Site (41LR2). *Caddoan Archeology Newsletter* IV(3):3.

Winchell, Frank, Jerome C. Rose, and Randall W. Moir
1992 *Bioanthropological Investigation of Nineteenth Century Burials at Site 41DT105.* Archaeology Research Program, Department of Anthropology, Southern Methodist University, Dallas.

Yates, Bonnie C.
1989 Vertebrate Faunal Remains. In *Archaeological Investigations at Cooper Lake: 1987 Season* (review draft), by Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators, pp. D-1 through D-50. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

1993 Zooarcheology of Four Woodland/Caddoan Sites at Cooper Lake. In *Excavations at the Tick, Spike, Johns Creek, and Peerless Bottoms Sites, Cooper Lake Project, Delta and Hopkins Counties, Texas*, by Ross C. Fields, Eloise F. Gadus, L. Wayne Klement, C. Britt Bousman, and Jerrilyn B. McLerran, pp. 307–334. Reports of Investigations No. 91. Prewitt and Associates, Inc., Austin.

APPENDIX A: Summary of Recorded Sites at Cooper Lake

TARL Trinomial	RBS Designation; SMU Designation; Site Name*	Prehistoric Component	Historic Component	References
41DT1	41-19C5-1; X41DT1; Manton Miller	Data Recovery		Moorman and Jelks 1952; Duffield 1959; Hyatt and Skinner 1971; Hyatt and Doehner 1975; Johnson 1962
41DT4	41-19C5-2	Survey		Moorman and Jelks 1952; Jurney et al. 1993
41DT5	41-19C5-16	Survey		Moorman and Jelks 1952; Duffield 1959; Jurney et al. 1993
41DT6	41-19C5-15; X41DT37; Tick	Data Recovery	Incidental	Moorman and Jelks 1952; Harris 1955; Hyatt and Skinner 1971; Doehner and Larson 1978; Jurney et al. 1993; Bousman et al. 1988; Fields et al. 1993; Gadus et al. 1991
41DT7	41-19C5-14; X41DT38	Survey	Survey	Moorman and Jelks 1952; Hyatt and Skinner 1971; Jurney et al. 1993
41DT10	41-19C5-12	Survey		Moorman and Jelks 1952
41DT11	41-19C5-13; X41DT65; Spider Knoll	Data Recovery	Incidental	Moorman and Jelks 1952; Hyatt and Skinner 1971; Jurney et al. 1993; Bousman et al. 1988; Gadus, Fields, and Bousman 1992; Fields et al. 1994
41DT12	41-19C5-9 (?)	Survey		Moorman and Jelks 1952
41DT13	41-19C5-4; X41DT5	Survey		Moorman and Jelks 1952; Duffield 1959; Hyatt and Skinner 1971; Jurney et al. 1993
41DT14	41-19C5-5; X41DT6	Survey	Survey	Moorman and Jelks 1952; Duffield 1959; Hyatt and Skinner 1971; Jurney et al. 1993
41DT15	41-19C5-8; X41DT10	Survey		Moorman and Jelks 1952; Duffield 1959; Hyatt and Skinner 1971; Gadus et al. 1991
41DT16	41-19C5-7; X41DT33; Spike	Data Recovery	Incidental	Moorman and Jelks 1952; Hatzenbuehler 1953; Duffield 1959; Hyatt and Skinner 1971; Doehner et al. 1978; Gadus et al. 1991; Fields et al. 1993
41DT17	41-19C5-3; X41DT24	Survey		Moorman and Jelks 1952; Duffield 1959; Hyatt and Skinner 1971
41DT18	41-19C5-6; X41DT7	Survey	Survey	Moorman and Jelks 1952; Duffield 1959; Hyatt and Skinner 1971; Jurney et al. 1993; Gadus et al. 1991
41DT19	41-19C5-25; X41DT3	Survey	Survey	Duffield 1959; Hyatt and Skinner 1971; Jurney et al. 1993
41DT20	41-19C5-26; X41DT9	Survey		Duffield 1959; Hyatt and Skinner 1971; Gadus et al. 1991
41DT21	X41DT66; L. O. Ray	Testing		Gilmore and Hoffrichter 1964; Hyatt and Skinner 1971; Jurney et al. 1993; Gadus, Fields, and Bousman 1992
41DT26	X41DT2	Survey		Hyatt and Skinner 1971; Jurney et al. 1993
41DT27	X41DT4	Survey		Hyatt and Skinner 1971; Jurney et al. 1993
41DT28	X41DT8	Survey		Hyatt and Skinner 1971; Gadus et al. 1991

*Refers to site numbering systems used by the River Basin Surveys and Southern Methodist University that appeared in print, but does not include temporary site numbers assigned by field crews; site names include only those that appear in print.

TARL Trinomial	RBS Designation; SMU Designation; Site Name	Prehistoric Component	Historic Component	References
41DT29	X41DT11; Free Hope	Survey	Survey	Hyatt and Skinner 1971; Doehner et al. 1978; Jurney et al. 1993
41DT30	X41DT12; Jarrell	Survey		Hyatt and Skinner 1971
41DT31	X41DT13; McKinney	Testing		Hyatt and Skinner 1971; Bousman et al. 1988
41DT32	X41DT14	Survey		Hyatt and Skinner 1971
41DT33	X41DT15	Survey		Hyatt and Skinner 1971
41DT34	X41DT16	Testing		Hyatt and Skinner 1971; Moir et al. 1989
41DT35	X41DT17; Thalya	Testing	Incidental	Hyatt and Skinner 1971; Hyatt and Doehner 1975; Doehner and Larson 1978
41DT36	X41DT18; Sharita	Testing		Hyatt and Skinner 1971; Doehner et al. 1978
41DT37	X41DT19; Ranger	Data Recovery	Incidental	Hyatt and Skinner 1971; Doehner and Larson 1978; Gadus et al. 1991
41DT38	X41DT20; Nathan Gable	Testing		Hyatt and Skinner 1971; Doehner and Larson 1978
41DT39	X41DT21	Survey		Hyatt and Skinner 1971
41DT40	X41DT22	Survey		Hyatt and Skinner 1971
41DT41	X41DT23	Survey		Hyatt and Skinner 1971; Jurney and Bohlin 1993
41DT42	X41DT25; Lilypad Pond	Testing	Incidental	Hyatt and Skinner 1971; Doehner et al. 1978
41DT43	X41DT26	Survey		Hyatt and Skinner 1971; Gadus et al. 1991
41DT44	X41DT27; Thundermouth Hollow	Testing	Incidental	Hyatt and Skinner 1971; Doehner et al. 1978
41DT45	X41DT28	Survey		Hyatt and Skinner 1971; Jurney et al. 1993
41DT46	X41DT29	Survey		Hyatt and Skinner 1971; Jurney et al. 1993
41DT47	X41DT30	Survey		Hyatt and Skinner 1971; Gadus et al. 1991
41DT48	X41DT31	Survey		Hyatt and Skinner 1971; Gadus et al. 1991
41DT49	X41DT32	Survey		Hyatt and Skinner 1971; Gadus et al. 1991
41DT50	X41DT34	Testing		Hyatt and Skinner 1971; Gadus et al. 1991; Gadus, Fields, and Bousman 1992
41DT51	X41DT35; Garbage Dump	Survey	Survey	Hyatt and Skinner 1971; Jurney et al. 1993; Doehner et al. 1978
41DT52	X41DT36; Luna	Testing	Incidental	Hyatt and Skinner 1971; Doehner and Larson 1978; Doehner et al. 1978; Jurney et al. 1993; Bousman et al. 1988; Gadus et al. 1991
41DT53	X41DT39	Survey		Hyatt and Skinner 1971; Jurney et al. 1993
41DT54	X41DT40	Testing		Hyatt and Skinner 1971; Gadus et al. 1991; Gadus, Fields, and Bousman 1992
41DT55	X41DT41	Survey		Hyatt and Skinner 1971; Jurney et al. 1993
41DT56	X41DT42	Survey		Hyatt and Skinner 1971; Jurney et al. 1993
41DT57	X41DT43	Survey		Hyatt and Skinner 1971
41DT58	41-19C5-9; X41DT44	Survey		Moorman and Jelks 1951; Hyatt and Skinner 1971; Gadus et al. 1991

TARL Trinomial	RBS Designation; SMU Designation; Site Name	Prehistoric Component	Historic Component	References
41DT59	X41DT45	Testing	Testing	Hyatt and Skinner 1971; Jurney et al. 1993; Cliff et al. 1995
41DT60	X41DT46	Survey		Hyatt and Skinner 1971; Jurney et al. 1993
41DT61	X41DT47	Survey		Hyatt and Skinner 1971; Jurney et al. 1993
41DT62	X41DT48; Johns Creek	Data Recovery		Hyatt and Skinner 1971; Gadus et al. 1991; Fields et al. 1993
41DT63	X41DT49	Testing		Hyatt and Skinner 1971; Gadus et al. 1991; Gadus, Fields, and Bousman 1992
41DT64	X41DT50	Survey		Hyatt and Skinner 1971
41DT65	X41DT51	Survey		Hyatt and Skinner 1971; Gadus et al. 1991
41DT66	X41DT52	Survey		Hyatt and Skinner 1971; Gadus et al. 1991
41DT67	X41DT53	Testing		Hyatt and Skinner 1971; Moir et al. 1989
41DT68	X41DT54	Testing		Hyatt and Skinner 1971; Moir et al. 1989
41DT69	X41DT55	Survey		Hyatt and Skinner 1971
41DT70	X41DT56	Survey		Hyatt and Skinner 1971
41DT71	X41DT57; Ewing	Testing		Hyatt and Skinner 1971; Hyatt et al. 1974; Moir et al. 1989
41DT72	X41DT58	Survey		Hyatt and Skinner 1971
41DT73	X41DT59	Testing		Hyatt and Skinner 1971
41DT74	X41DT60	Survey		Hyatt and Skinner 1971; Gadus et al. 1991
41DT75	X41DT61; Naiolithic	Testing	Incidental	Hyatt and Skinner 1971; Doehner et al. 1978
41DT76	X41DT62	Survey		Hyatt and Skinner 1971
41DT77	X41DT63	Survey		Hyatt and Skinner 1971
41DT78	X41DT64; Dewitt	Survey		Hyatt and Skinner 1971; Doehner et al. 1978
41DT80	X41DT68; Thomas	Data Recovery	Incidental	Hyatt et al. 1974; Hyatt and Doehner 1975; Moir et al. 1989
41DT81	X41DT69	Testing		Moir et al. 1989
41DT82	X41DT70	Survey		TARL files
41DT83	X41DT71	Testing		Moir et al. 1989
41DT84	X41DT72; Overlook	Testing		Doehner et al. 1978
41DT85		Survey		None
41DT87			Survey	Perttula 1988; Jurney and Bohlin 1993
41DT88			Testing	Perttula 1988; Perttula 1989a; Jurney and Bohlin 1993
41DT89			Survey	Perttula 1988
41DT90			Survey	Perttula 1988; Jurney and Bohlin 1993
41DT91			Testing	Perttula 1988; Perttula 1989a; Jurney and Bohlin 1993
41DT92			Survey	Perttula 1988
41DT93			Survey	Perttula 1988

TARL Trinomial	RBS Designation; SMU Designation; Site Name	Prehistoric Component	Historic Component	References
41DT94			Survey	Perttula 1988
41DT95			Survey	Perttula 1988
41DT96			Survey	Perttula 1988
41DT97	James Franks	Survey	Data Recovery	Perttula 1988; Perttula 1989b
41DT98	Q. Miller	Survey		Perttula 1988
41DT99			Survey	Perttula 1988; Jurney and Bohlin 1993
41DT100			Survey	Perttula 1988; Jurney and Bohlin 1993
41DT101			Survey	Perttula 1988; Jurney and Bohlin 1993
41DT102	Dawson Cemetery		Relocated	Perttula 1988; Jurney and Bohlin 1993
41DT103	L. E. Sandlin	Survey		Perttula 1988; Jurney and Bohlin 1993
41DT104	Tucker Cemetery		Relocated	Lebo 1988
41DT105	Sinclair Cemetery		Data Recovery; Relocated	Lebo 1988; Winchell et al. 1992
41DT106		Testing		Moir et al. 1989
41DT107	John T. Talley		Testing	Moir et al. 1989
41DT108		Testing		Moir et al. 1989
41DT109		Testing		Moir et al. 1989
41DT110		Testing		Moir et al. 1989
41DT111		Testing		Moir et al. 1989
41DT112		Testing		Moir et al. 1989
41DT113	John C. Wright	Testing	Data Recovery	Moir et al. 1989
41DT114		Testing		Moir et al. 1989
41DT115		Testing	Survey	Moir et al. 1989
41DT116		Testing		Moir et al. 1989
41DT117		Testing		Moir et al. 1989
41DT118	Zephriah Dawson		Data Recovery	Moir et al. 1989; Jurney and Bohlin 1993
41DT119			Testing	Moir et al. 1989; Jurney and Bohlin 1993
41DT120	Carl V. Dawson		Testing	Moir et al. 1989; Jurney and Bohlin 1993
41DT121	John B. Talley		Testing	Moir et al. 1989
41DT122			Survey	Moir et al. 1989
41DT123			Survey	Moir et al. 1989
41DT124	Doctors Creek	Data Recovery	Testing	Moir et al. 1989
41DT125	Alex Sinclair II		Survey	Moir et al. 1989
41DT126	Robert Hannah		Data Recovery	Moir et al. 1989; Bousman et al. 1988
41DT127		Testing		Moir et al. 1989
41DT128		Testing		Moir et al. 1989
41DT129		Survey		Moir et al. 1989
41DT130		Survey		Moir et al. 1989

TARL Trinomial	RBS Designation; SMU Designation; Site Name	Prehistoric Component	Historic Component	References
41DT131		Survey		Moir et al. 1989
41DT132		Survey		Moir et al. 1989
41DT133		Testing		Moir et al. 1989
41DT134		Testing		Moir et al. 1989
41DT135			Survey	Moir et al. 1989
41DT136			Survey	Moir et al. 1989
41DT137			Survey	Moir et al. 1989
41DT138			Survey	Moir et al. 1989
41DT139			Survey	Moir et al. 1989
41DT140			Survey	Moir et al. 1989
41DT141		Testing		Bousman et al. 1988; Gadus et al. 1991; Jurney et al. 1993
41DT142		Survey		Bousman et al. 1988
41DT143		Survey		Bousman et al. 1988; Jurney et al. 1993
41DT144		Survey		Bousman et al. 1988; Jurney et al. 1993
41DT145		Survey		Bousman et al. 1988
41DT146		Survey		Bousman et al. 1988
41DT147		Survey		Bousman et al. 1988
41DT148			Survey	Jurney and Bohlin 1993
41DT149		Survey		Jurney and Bohlin 1993
41DT150		Survey		Jurney and Bohlin 1993
41DT151		Survey		Jurney and Bohlin 1993
41DT152		Survey		Jurney and Bohlin 1993
41DT153		Survey	Survey	Jurney and Bohlin 1993
41DT154		Testing	Survey	Jurney and Bohlin 1993; Gadus et al. 1991
41DT155			Survey	Jurney and Bohlin 1993
41DT156		Survey		Jurney and Bohlin 1993
41DT157			Survey	Jurney and Bohlin 1993
41DT158			Survey	Jurney and Bohlin 1993
41DT159			Survey	Jurney and Bohlin 1993
41DT160			Survey	Jurney and Bohlin 1993
41DT161		Testing		Jurney et al. 1993
41DT162		Survey	Survey	Jurney et al. 1993
41DT163		Survey		Jurney et al. 1993
41DT164		Survey		Jurney et al. 1993
41DT165		Survey		Jurney et al. 1993
41DT166		Survey		Jurney et al. 1993
41DT167		Survey		Jurney et al. 1993
41DT168		Survey		Jurney et al. 1993

TARL Trinomial	RBS Designation; SMU Designation; Site Name	Prehistoric Component	Historic Component	References
41DT169		Survey		Jurney et al. 1993
41DT170		Survey		Jurney et al. 1993
41DT171		Survey		Jurney et al. 1993
41DT172		Survey		Jurney et al. 1993
41DT173		Survey		Jurney et al. 1993
41DT174		Survey		Jurney et al. 1993
41DT175		Survey		Jurney et al. 1993
41DT176		Survey		Jurney et al. 1993
41DT177		Survey		Jurney et al. 1993
41DT178		Survey		Jurney et al. 1993
41DT179		Survey		Jurney et al. 1993
41DT180	Friendship Cemetery/ Church/School	Survey	Relocated	Jurney et al. 1993
41DT181		Testing	Testing	Jurney et al. 1993
41DT182		Survey	Survey	Jurney et al. 1993
41DT183			Survey	Jurney et al. 1993
41DT184			Survey	Jurney et al. 1993
41DT185			Survey	Jurney et al. 1993
41DT186			Survey	Jurney et al. 1993
41DT187			Survey	Jurney et al. 1993
41DT188			Survey	Jurney et al. 1993
41DT189			Survey	Jurney et al. 1993
41DT190			Survey	Jurney et al. 1993
41DT191			Survey	Jurney et al. 1993
41DT192	John Derrick		Testing	Jurney et al. 1993; Green et al. 1996
41DT193			Survey	Jurney et al. 1993
41DT194			Survey	Jurney et al. 1993
41DT195			Survey	Jurney et al. 1993
41DT196			Survey	Jurney et al. 1993
41DT197			Survey	Jurney et al. 1993
41DT198			Survey	Jurney et al. 1993
41DT199			Survey	Jurney et al. 1993
41DT200			Survey	Jurney et al. 1993
41DT201			Survey	Jurney et al. 1993
41DT202			Survey	Jurney et al. 1993
41DT203		Survey	Survey	Jurney et al. 1993
41DT204			Survey	Jurney et al. 1993
41DT205			Survey	Jurney et al. 1993
41DT206			Survey	Jurney et al. 1993

TARL Trinomial	RBS Designation; SMU Designation; Site Name	Prehistoric Component	Historic Component	References
41DT207			Survey	Jurney et al. 1993
41DT208	John Hancock		Testing	Jurney et al. 1993; Green et al. 1996
41DT209			Survey	Jurney et al. 1993
41DT210			Survey	Jurney et al. 1993
41DT211			Survey	Jurney et al. 1993
41DT212			Survey	Jurney et al. 1993
41DT213			Survey	Jurney et al. 1993
41DT214		Survey	Survey	Jurney et al. 1993
41DT215			Survey	Jurney et al. 1993
41DT216			Survey	Jurney et al. 1993
41DT217			Survey	Jurney et al. 1993
41DT218			Survey	Jurney et al. 1993
41DT219			Survey	Jurney et al. 1993
41DT220			Survey	Jurney et al. 1993
41DT221			Survey	Jurney et al. 1993
41DT222			Survey	Jurney et al. 1993
41DT223			Survey	Jurney et al. 1993
41DT224			Survey	Jurney et al. 1993
41DT225			Survey	Jurney et al. 1993
41DT226			Survey	Jurney et al. 1993
41DT227		Survey		Jurney et al. 1993
41DT228			Survey	Jurney et al. 1993
41DT229			Survey	Jurney et al. 1993
41DT230			Survey	Jurney et al. 1993
41DT231			Survey	Jurney et al. 1993
41DT232			Survey	Jurney et al. 1993
41DT233			Survey	Jurney et al. 1993
41DT234			Survey	Jurney et al. 1993
41DT235		Survey	Survey	Jurney et al. 1993
41DT236			Survey	Jurney et al. 1993
41DT237			Survey	Jurney et al. 1993
41DT238			Survey	Jurney et al. 1993
41DT239			Survey	Jurney et al. 1993
41DT240			Survey	Jurney et al. 1993
41DT241		Survey		Jurney et al. 1993
41DT242		Survey		Jurney et al. 1993
41DT243			Survey	Jurney et al. 1993
41DT244			Survey	Jurney et al. 1993

TARL Trinomial	RBS Designation; SMU Designation; Site Name	Prehistoric Component	Historic Component	References
41DT245			Survey	Jurney et al. 1993
41DT246	Free Hope Baptist Church		Survey	Jurney et al. 1993
41DT247		Testing	Incidental	Jurney et al. 1993; Cliff et al. 1995
41DT248			Survey	Jurney et al. 1993
41DT249	Wallace Carter		Testing	Jurney et al. 1993; Green et al. 1996
41DT250			Survey	Bailey et al. 1991
41DT251			Survey	Bailey et al. 1991
41DT252			Survey	Bailey et al. 1991
41DT253			Survey	Bailey et al. 1991
41DT254			Survey	Bailey et al. 1991
41DT255			Survey	Bailey et al. 1991
41DT256			Survey	Bailey et al. 1991
41DT257			Survey	Bailey et al. 1991
41DT258		Survey		Bailey et al. 1991
41DT259			Relocated	TARL files; Jurney et al. 1993
41DT260			Survey	Jurney et al. 1993
41DT261		Survey		Jurney et al. 1993
41HP6		Survey		TARL files; Moir et al. 1989
41HP7		Survey		TARL files
41HP10		Survey		TARL files
41HP16	41-19C5-17	Survey	Survey	Moorman and Jelks 1952; Jurney et al. 1993
41HP17	41-19C5-18	Survey		Moorman and Jelks 1952; Jurney et al. 1993
41HP18	41-19C5-19; X41HP19; Carp	Testing	Incidental	Moorman and Jelks 1952; Hyatt and Skinner 1971; Doehner et al. 1978; Jurney et al. 1993
41HP19	41-19C5-20	Survey		Moorman and Jelks 1952; Jurney et al. 1993
41HP20	41-19C5-21; X41HP1	Survey		Moorman and Jelks 1952; Hyatt and Skinner 1971; Jurney et al. 1993
41HP21	41-19C5-22; X41HP6	Survey		Moorman and Jelks 1952; Hyatt and Skinner 1971
41HP22	41-19C5-23	Survey		Moorman and Jelks 1952
41HP23	41-19C5-24; X41HP10	Survey		Moorman and Jelks 1952; Hyatt and Skinner 1971
41HP24	14-19C5-1	Survey		TARL files
41HP74	X41HP2; Society	Testing		Hyatt and Skinner 1971; Jurney et al. 1993
41HP75	X41HP3	Survey	Survey	Hyatt and Skinner 1971; Jurney et al. 1993
41HP76	X41HP4	Survey	Survey	Hyatt and Skinner 1971; Jurney et al. 1993
41HP77	X41HP5; Sawmill	Testing	Incidental	Hyatt and Skinner 1971; Doehner et al. 1978; Jurney et al. 1993

TARL Trinomial	RBS Designation; SMU Designation; Site Name	Prehistoric Component	Historic Component	References
41HP78	X41HP7; Lawson	Data Recovery		Hyatt and Skinner 1971; Hyatt et al. 1974; Perttula 1988; Moir et al. 1989
41HP79	X41HP10 (?)	Survey		Hyatt and Skinner 1971; Gadus et al. 1991
41HP80	X41HP11; Rebel Ridge	Testing	Incidental	Hyatt and Skinner 1971; Doehner et al. 1978; Jurney et al. 1993
41HP81	X41HP12; Willow Ann	Testing		Hyatt and Skinner 1971; Doehner et al. 1978; Jurney et al. 1993
41HP82	X41HP13	Survey		Hyatt and Skinner 1971; Jurney et al. 1993
41HP83	X41HP14	Survey		Hyatt and Skinner 1971; Jurney et al. 1993
41HP84	X41HP15	Survey		Hyatt and Skinner 1971; Jurney et al. 1993
41HP85	X41HP16	Survey		Hyatt and Skinner 1971; Jurney et al. 1993
41HP86	X41HP17	Survey		Hyatt and Skinner 1971; Jurney et al. 1993
41HP87	X41HP18; April	Testing	Incidental	Hyatt and Skinner 1971; Doehner et al. 1978; Jurney et al. 1993
41HP88	X41HP20; Razor's Edge	Testing		Hyatt and Skinner 1971; Doehner et al. 1978; Jurney et al. 1993
41HP89	X41HP21	Survey		Hyatt and Skinner 1971; Jurney et al. 1993
41HP90	X41HP22	Survey	Survey	Hyatt and Skinner 1971; Jurney et al. 1993
41HP91	X41HP23	Survey		Hyatt and Skinner 1971; Jurney and Bohlin 1993
41HP92	X41HP24	Survey	Survey	Hyatt and Skinner 1971; Jurney and Bohlin 1993
41HP93	X41HP25	Survey		Hyatt and Skinner 1971; Jurney and Bohlin 1993
41HP94	X41HP26	Survey		Hyatt and Skinner 1971; Jurney and Bohlin 1993
41HP95	X41HP27	Survey		Hyatt and Skinner 1971; Jurney and Bohlin 1993
41HP96	X41HP28	Survey		Hyatt and Skinner 1971; Jurney and Bohlin 1993
41HP97	X41HP29	Survey		Hyatt and Skinner 1971
41HP98	X41HP30; Finley	Survey		Hyatt and Skinner 1971
41HP99	X41HP31	Survey		Hyatt and Skinner 1971
41HP100	X41HP32	Survey		Hyatt and Skinner 1971
41HP101	X41HP33	Survey		Hyatt and Skinner 1971
41HP102	X41HP34; Arnold	Data Recovery	Incidental	Hyatt and Skinner 1971; Doehner and Larson 1978; Jurney and Bohlin 1993; Gadus et al. 1991
41HP103	X41HP35; Buckshot	Testing	Survey	Hyatt and Skinner 1971; Doehner et al. 1978; Jurney and Bohlin 1993
41HP104	X41HP36	Survey		Hyatt and Skinner 1971; Moir et al. 1989
41HP105	X41HP37; Cox	Data Recovery	Incidental	Hyatt and Skinner 1971; Hyatt et al. 1974; Hyatt and Doehner 1975; Moir et al. 1989

TARL Trinomial	RBS Designation; SMU Designation; Site Name	Prehistoric Component	Historic Component	References
41HP106	X41HP38; Hurricane Hill	Data Recovery	Testing	Hyatt and Skinner 1971; Perttula 1988; Perttula 1989a; Perttula 1990
41HP107	X41HP43	Survey		TARL files; Jurney et al. 1993
41HP108	X41HP39	Survey		TARL files
41HP110			Survey	Bousman 1986; Jurney et al. 1993
41HP111		Survey		Bousman 1986; Fields and Garvey 1986; Jurney et al. 1993
41HP112			Survey	Perttula 1988
41HP113	W. Alley	Survey		Perttula 1988
41HP114			Survey	Perttula 1988
41HP115	W. S. Long # 1	Survey		Perttula 1988
41HP116	W. S. Long # 2	Testing		Perttula 1988; Moir et al. 1989
41HP117		Survey	Survey	Perttula 1988
41HP118	W. S. Long # 3	Testing		Perttula 1988; Moir et al. 1989
41HP119		Survey		Fields and Garvey 1986; Jurney et al. 1993
41HP134		Survey		Moir et al. 1989
41HP135		Testing		Moir et al. 1989
41HP136		Testing		Moir et al. 1989
41HP137		Data Recovery		Moir et al. 1989
41HP138		Testing		Moir et al. 1989
41HP139		Survey		Moir et al. 1989
41HP140		Survey	Survey	Moir et al. 1989
41HP141		Survey	Survey	Moir et al. 1989
41HP142		Survey	Testing	Moir et al. 1989
41HP143	Lodwig Vaden	Testing	Testing	Moir et al. 1989; Jurney and Bohlin 1993
41HP144		Survey	Survey	Moir et al. 1989; Jurney and Bohlin 1993
41HP145			Survey	Moir et al. 1989; Jurney and Bohlin 1993
41HP146			Survey	Moir et al. 1989
41HP147		Survey		Moir et al. 1989
41HP148		Survey		Moir et al. 1989
41HP149		Survey		Moir et al. 1989
41HP150		Survey		Moir et al. 1989
41HP151			Survey	Moir et al. 1989
41HP152			Testing	Moir et al. 1989
41HP153			Testing	Moir et al. 1989
41HP154		Survey		Bousman et al. 1988
41HP155		Testing		Bousman et al. 1988; Gadus et al. 1991; Jurney and Bohlin 1993
41HP156		Survey		Bousman et al. 1988

TARL Trinomial	RBS Designation; SMU Designation; Site Name	Prehistoric Component	Historic Component	References
41HP158		Testing	Testing	McGregor and Roemer 1989; Jurney and Bohlin 1993
41HP159	Finley Fan	Data Recovery		Jurney and Bohlin 1993; Jurney et al. 1993; Gadus, Fields, Bousman, and Howard 1992
41HP160		Survey		Jurney and Bohlin 1993
41HP161			Survey	Jurney and Bohlin 1993
41HP162		Survey	Survey	Jurney and Bohlin 1993
41HP163		Survey	Survey	Jurney and Bohlin 1993
41HP164		Survey		Jurney and Bohlin 1993
41HP165		Survey	Survey	Jurney and Bohlin 1993
41HP166		Survey	Survey	Jurney and Bohlin 1993
41HP167		Survey	Survey	Jurney and Bohlin 1993
41HP168	Appliance	Survey		Jurney and Bohlin 1993
41HP169			Survey	Jurney and Bohlin 1993
41HP170		Survey	Survey	Jurney and Bohlin 1993
41HP171		Survey		Jurney and Bohlin 1993
41HP172		Survey		Jurney and Bohlin 1993; Gadus et al. 1991
41HP173		Survey	Survey	Jurney and Bohlin 1993
41HP174	Finley Quarry	Survey		Jurney and Bohlin 1993
41HP175	Peerless Bottoms	Data Recovery		Jurney and Bohlin 1993; Fields et al. 1993
41HP176		Survey		Jurney and Bohlin 1993
41HP177			Survey	Jurney and Bohlin 1993
41HP178		Survey	Survey	Jurney and Bohlin 1993
41HP179		Survey		Jurney et al. 1993
41HP180		Survey		Jurney et al. 1993
41HP181		Survey		Jurney et al. 1993
41HP182		Survey		Jurney et al. 1993
41HP183		Survey		Jurney et al. 1993
41HP184		Survey		Jurney et al. 1993
41HP185		Survey		Jurney et al. 1993
41HP186			Survey	Jurney et al. 1993
41HP187			Survey	Jurney et al. 1993
41HP188		Survey	Survey	Jurney et al. 1993
41HP189			Survey	Jurney et al. 1993
41HP191		Survey		Fields et al. 1993

REFERENCES CITED

Bailey, Gail L., Douglas K. Boyd, and C. Britt Bousman
1991 *Archeological Survey of the City Lakes Area and Geomorphological and Magnetometer Surveys, Cooper Lake Project, Delta and Hopkins Counties, Texas.* Technical Reports No. 11. Prewitt and Associates, Inc., Austin.

Bousman, C. Britt
1986 *An Archeological Survey of a Proposed Phillips 66 Natural Gas Company Pipeline, Hopkins County, Texas.* Letter Report 336. Prewitt and Associates, Inc., Austin.

Bousman, C. Britt, Michael B. Collins, and Timothy K. Perttula
1988 *Quaternary Geomorphology at Cooper Basin: A Framework for Archeological Inquiry, Delta and Hopkins Counties, Texas.* Reports of Investigations No. 55. Prewitt and Associates, Inc., Austin.

Cliff, Maynard B., Melissa M. Green, Steven M. Hunt, and David Shanabrook
1995 *Archeological Test Excavations at Two Prehistoric Sites (41DT59 and 41DT247) at Cooper Lake, Delta County, Texas, 1994.* Miscellaneous Report of Investigations No. 90. Geo-Marine, Inc., Plano, Texas.

Doehner, Karen, and Richard E. Larson
1978 *Archaeological Research at the Proposed Cooper Lake, Northeast Texas, 1974–1975.* Research Report 108. Archaeology Research Program, Southern Methodist University, Dallas.

Doehner, Karen, Duane Peter, and S. Alan Skinner
1978 *Evaluation of the Archaeology of the Proposed Cooper Lake.* Research Report 114. Archaeology Research Program, Southern Methodist University, Dallas.

Duffield, Lathel F.
1959 *Archeological Reconnaissance at Cooper Reservoir, Delta and Hopkins Counties, Texas.* Report submitted to the U.S. National Park Service by the Texas Archeological Salvage Project, The University of Texas at Austin.

Fields, Ross C., Eloise F. Gadus, L. Wayne Klement, C. Britt Bousman, and Jerrilyn B. McLerran
1993 *Excavations at the Tick, Spike, Johns Creek, and Peerless Bottoms Sites, Cooper Lake Project, Delta and Hopkins Counties, Texas.* Reports of Investigations No. 91. Prewitt and Associates, Inc., Austin.

Fields, Ross C., Eloise F. Gadus, L. Wayne Klement, and Karen M. Gardner
1994 *Excavations at the Spider Knoll Site, Cooper Lake Project, Delta County, Texas.* Reports of Investigations Number 96. Prewitt and Associates, Inc., Austin.

Fields, Ross C., and Colin Garvey
1986 *Archeological Monitoring of Portions of a Phillips 66 Natural Gas Company Pipeline, Hopkins County, Texas.* Letter Report No. 338. Prewitt and Associates, Inc., Austin.

Gadus, Eloise F., Ross C. Fields, and C. Britt Bousman
1992 *Archeological Investigations at 41DT11, 41DT21, 41DT50, 41DT54, and 41DT63 at Cooper Lake, Delta County, Texas.* Reports of Investigations No. 86. Prewitt and Associates, Inc., Austin.

Gadus, Eloise F., Ross C. Fields, C. Britt Bousman, and Margaret A. Howard
1992 *Excavations at the Finley Fan Site, 41HP159, Hopkins County, Texas.* Reports of Investigations No. 78. Prewitt and Associates, Inc., Austin.

Gadus, Eloise F., Ross C. Fields, L. Wayne Klement, C. Britt Bousman, Margaret A. Howard, and Karen M. Gardner
1991 *Testing, Revisitation, and Evaluation of Selected Sites at Cooper Lake, Delta and Hopkins Counties, Texas.* Reports of Investigations No. 81. Prewitt and Associates, Inc., Austin.

Gilmore, Kathleen, and Norma Hoffrichter
1964 Preliminary Investigations of the L. O. Ray Site, Delta County, Texas. *The Record, Newsletter of the Dallas Archeological Society* 19(1):3–17.

Green, Melissa M., Duane E. Peter, and Donna K. Shepard
1994 *Friendship: An African-American Community on the Prairie Margin of Northeast Texas.* Miscellaneous Report of Investigations No. 81. Geo-Marine, Inc., Plano, Texas.

Harris, R. K.
1955 A Flexed Burial, Site 19C5-15, Delta County, Texas. *The Record, Newsletter of the Dallas Archeological Society* 14(2):8–10.

Hatzenbuehler, R.
1953 A Flexed Burial, Delta County, Texas. *The Record, Newsletter of the Dallas Archeological Society* 11(4):16–17.

Hyatt, Robert D., Barbara H. Butler, and Herbert P. Mosca, III
1974 *Archaeological Research at Cooper Lake, 1970–1972.* Contributions in Anthropology No. 12. Southern Methodist University, Dallas.

Hyatt, Robert D., and Karen Doehner
1975 *Archaeological Research at Cooper Lake, Northeast Texas, 1973.* Contributions in Anthropology No. 15. Southern Methodist University, Dallas.

Hyatt, Robert D., and S. Alan Skinner
1971 *Archaeological Resources of the Cooper Reservoir, Texas.* Report submitted to the National Park Service by the Department of Anthropology, Southern Methodist University, Dallas.

Johnson, LeRoy, Jr.
1962 The Yarbrough and Miller Sites of Northeast Texas, with a Preliminary Definition of the La Harpe Aspect. *Bulletin of the Texas Archeological Society* 32:141–284.

Jurney, David H., and Jeffery Bohlin
1993 *Archaeological Survey of Cooper Lake, Delivery Order Number 6, 1989.* Archaeology Research Program, Department of Anthropology, Southern Methodist University, Dallas.

Jurney, David H., Jeffery Bohlin, Sue E. Linder-Linsley, S. Christopher Caran, and David R. Pedler
1993 *Archaeological Survey of Cooper Lake, Delivery Order Number 7, 1989.* Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

Lebo, Susan A.
1988 *An Archaeological and Bioarchaeological Perspective: The Tucker (41DT104) and Sinclair (41DT105) Cemeteries of Delta County, Texas.* Institute of Applied Sciences, The University of North Texas, Denton.

McGregor, Daniel E., and Erwin Roemer
1989 Archeological Survey at Cooper Lake, Proposed Water Intake Easement for North Texas Municipal Water District, Hopkins County, Texas. Letter report prepared by the U.S. Army Corps of Engineers, Fort Worth District.

Moir, Randall W., Daniel E. McGregor, and David H. Jurney (Co-Principal Investigators)
1989 *Archaeological Investigations at Cooper Lake: 1987 Season* (review draft). Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

Moorman, Edward H., and E. B. Jelks
1952 *Appraisal of the Archeological Resources of the Cooper Reservoir, Delta and Hopkins Counties, Texas.* Report prepared by the River Basin Surveys, Smithsonian Institution, Washington, D.C.

Perttula, Timothy K.
1988 *Cultural Resources Survey at Cooper Lake, Delta and Hopkins Counties, Texas.* Institute of Applied Sciences, The University of North Texas, Denton.

1989a *Test Excavations at Three Late Nineteenth/ Early Twentieth Century Farmsteads at Cooper Lake, Delta and Hopkins Counties, Texas.* Contributions in Archaeology No. 8. Institute of Applied Sciences, The University of North Texas, Denton.

1989b *The James Franks Site (41DT97): Excavations at a Mid Nineteenth Century Farmstead in the South Sulphur River Valley, Cooper Lake Project, Texas.* Contributions in Archaeology No. 7. Institute of Applied Sciences, The University of North Texas, Denton.

1990 *The Hurricane Hill Site (41HP106): Excavations at Cooper Lake, Hopkins County, Texas* (second draft). Contributions in Archaeology No. 9. Institute of Applied Sciences, University of North Texas, Denton.

Winchell, Frank, Jerome C. Rose, and Randall W. Moir
1992 *Bioanthropological Investigation of Nineteenth Century Burials at Site 41DT105.* Archaeology Research Program, Department of Anthropology, Southern Methodist University, Dallas.

APPENDIX B: Radiocarbon Dates from Cooper Lake

Provenience	Lab Number	Material	^{14}C Age (B.P.)	Corrected Age (B.P.)*	Reference
41DT6:					
Test Square 2, 5–10 cm	SMU-359	charcoal	115.9 ± 0.9% of modern	–	Gadus et al. 1991; Haas 1987
Test Square 10, 30–35 cm	SMU-349	charcoal	1320 ± 190	–	Doehner and Larson 1978; Gadus et al. 1991; Haas 1987
Flotation Column 1, Level 2	Beta-51364	nutshells	1270 ± 60	1250 ± 60 (–26.2)	Fields et al. 1993
Flotation Column 1, Level 4	Beta-51365	nutshells	1790 ± 100	1770 ± 100 (–26.1)	Fields et al. 1993
Flotation Column 2, Level 2	Beta-51366	nutshells	1300 ± 80	1300 ± 80 (–25.0)	Fields et al. 1993
Flotation Column 2, Level 3	Beta-51367	nutshells	1370 ± 80	1370 ± 80 (–25.5)	Fields et al. 1993
Flotation Column 2, Level 4	Beta-51368	nutshells	1470 ± 80	1460 ± 80 (–25.8)	Fields et al. 1993
Excavation Units 6 and 12–14, Level 5	Beta-52240	nutshells	1120 ± 70	1110 ± 70 (–25.8)	Fields et al. 1993
41DT11:					
Feature 1	Beta-48768	nutshells	1060 ± 80	1040 ± 80 (–26.5)	Fields et al. 1994; Gadus, Fields, and Bousman 1992
Feature 2	Beta-48769	nutshells	1140 ± 90	1120 ± 90 (–26.7)	Fields et al. 1994; Gadus, Fields, and Bousman 1992
Feature 5	Beta-46860/ ETH-8505	nutshells	–	960 ± 50	Fields et al. 1994; Gadus, Fields, and Bousman 1992
Feature 22	Beta-65800	wood charcoal	1400 ± 170	1380 ± 170 (–26.5)	Fields et al. 1994
Feature 35	Beta-65801	wood charcoal	880 ± 90	850 ± 90 (–26.4)	Fields et al. 1994
Feature 51	Beta-65797/ ETH-11093	nutshells	725 ± 55	790 ± 55 (–20.9)	Fields et al. 1994
Feature 73	Beta-65798/ ETH-11094	nutshells	985 ± 55	1065 ± 55 (–19.8)	Fields et al. 1994
Feature 75	Beta-65802/ ETH-11096	nutshells	890 ± 55	910 ± 55 (–23.9)	Fields et al. 1994

*Ages not calibrated; δ^{13}C values in parentheses where known.

NOTE: All dates from archeological sites are listed by site, but not all of these are from cultural contexts; this is most often the case with humate dates.

Provenience	Lab Number	Material	^{14}C Age (B.P.)	Corrected Age (B.P.)	Reference
Feature 117	Beta-65799/ ETH-11095	nutshells	1095 ± 55	1100 ± 55 (–24.7)	Fields et al. 1994
Feature 125	Beta-65803	wood charcoal	1120 ± 80	1080 ± 80 (–27.4)	Fields et al. 1994
Feature 129	Beta-65796/ ETH-11092	nutshells	1080 ± 55	1095 ± 55 (–24.1)	Fields et al. 1994
Feature 135	Beta-63303	nutshells	930 ± 50	930 ± 50 (–25.2)	Fields et al. 1994
Feature 136	Beta-63304	nutshells	850 ± 70	830 ± 70 (–26.1)	Fields et al. 1994
Feature 137	Beta-65804	wood charcoal	850 ± 80	830 ± 80 (–26.4)	Fields et al. 1994
Feature 147	Beta-63305	nutshells	1010 ± 70	1010 ± 70 (–24.9)	Fields et al. 1994
Test Unit 10, Level 5	Beta-46859	nutshells	840 ± 60	810 ± 60 (–26.4)	Fields et al. 1994; Gadus, Fields, and Bousman 1992
Test Unit 10, Level 8	Beta-46858	nutshells	1030 ± 60	1040 ± 60 (–24.8)	Fields et al. 1994; Gadus, Fields, and Bousman 1992
Excavation Unit 6, Level 1	Beta-63297/ ETH-10768	nutshells	–	940 ± 50	Fields et al. 1994
Excavation Unit 9, Level 5	Beta-63298	nutshells	590 ± 80	580 ± 80 (–25.6)	Fields et al. 1994
Excavation Unit 9, Level 9	Beta-63299/ ETH-10769	nutshells	–	770 ± 50	Fields et al. 1994
Excavation Unit 13, Level 1	Beta-63300/ ETH-10770	nutshells	–	925 ± 50	Fields et al. 1994
Excavation Unit 13, Level 4	Beta-63301	nutshells	1020 ± 60	1010 ± 60 (–25.5)	Fields et al. 1994
Excavation Unit 14, Level 9	Beta-63302/ ETH-10771	nutshells	–	920 ± 55	Fields et al. 1994
41DT16:					
Feature 3	Beta-51369	nutshells	1060 ± 90	1060 ± 90 (–25.2)	Fields et al. 1993
Feature 8	Beta-51370	nutshells	1140 ± 70	1130 ± 70 (–25.9)	Fields et al. 1993
Feature 17	Beta-51371	nutshells	2090 ± 90	2080 ± 90 (–25.7)	Fields et al. 1993
Test Pit 10, 45–50 cm	SMU-401	charcoal	1060 ± 70	–	Gadus et al. 1991; Haas 1987
Test Pit 14, 45–50 cm	SMU-398	charcoal	200 ± 80	–	Gadus et al. 1991; Haas 1987

Provenience	Lab Number	Material	^{14}C Age (B.P.)	Corrected Age (B.P.)	Reference
Excavation Units 8 and 9, Level 8	Beta-52241	nutshells	1300 ± 60	1290 ± 60 (–25.5)	Fields et al. 1993
Excavation Unit 9, Level 6	Beta-51372	nutshells	1300 ± 80	1290 ± 80 (–26.0)	Fields et al. 1993
Excavation Unit 13, Level 3	Beta-51373	nutshells	800 ± 70	770 ± 70 (–26.8)	Fields et al. 1993
Excavation Units 13 and 19, Level 8	Beta-52242	nutshells	1330 ± 70	1310 ± 70 (–25.9)	Fields et al. 1993
Excavation Units 17 and 18, Level 9	Beta-52243	nutshells	1230 ± 80	1220 ± 80 (–25.7)	Fields et al. 1993
Excavation Units 19 and 26, Level 10	Beta-52244	nutshells	1550 ± 90	1560 ± 90 (–24.8)	Fields et al. 1993
Excavation Unit 25, Level 6	Beta-51374	nutshells	1090 ± 70	1070 ± 70 (–26.5)	Fields et al. 1993
Excavation Units 26 and 27, Level 8	Beta-52245	nutshells	1520 ± 60	1530 ± 60 (–24.8)	Fields et al. 1993
Excavation Unit 28, Level 3	Beta-51375	nutshells	930 ± 80	930 ± 80 (–25.5)	Fields et al. 1993
41DT21:					
Feature 2	Beta-46861	wood charcoal	1320 ± 80	1270 ± 80 (–27.6)	Gadus, Fields, and Bousman 1992
Test Unit 6, Level 4	Beta-46862/ ETH-8506	nutshells	–	1045 ± 50	Gadus, Fields, and Bousman 1992
Test Unit 8, Level 3	Beta-46863/ ETH-8507	wood charcoal	–	170 ± 50	Gadus, Fields, and Bousman 1992
41DT37:					
Test Square 46, 10–15 cm	SMU-363	charcoal	270 ± 60	–	Gadus et al. 1991; Haas 1987
41DT42:					
Test Pit 7, 20–25 cm	SMU-477	charcoal	1060 ± 120	–	Haas 1987
41DT50:					
Test Unit 1, Level 4	Beta-46857	wood charcoal	660 ± 80	640 ± 80 (–26.2)	Gadus, Fields, and Bousman 1992
41DT52:					
Feature 15A	SMU-476	charcoal	1300 ± 150	–	Gadus et al. 1991; Haas 1987
Feature 21A	SMU-396	charcoal	920 ± 40	–	Gadus et al. 1991; Haas 1987
Feature 31A	SMU-417	charcoal	160 ± 45	–	Gadus et al. 1991; Haas 1987

Provenience	Lab Number	Material	^{14}C Age (B.P.)	Corrected Age (B.P.)	Reference
Test Pit 19, 20–30 cm	SMU-471	charcoal	280 ± 70	–	Gadus et al. 1991; Haas 1987
Test Pit 30, 30–40 cm	SMU-404	charcoal	660 ± 70	–	Gadus et al. 1991; Haas 1987
41DT59:					
Unit 31, Level 5	Beta-81670/ CAMS-19860	nutshells	2660 ± 50	2640 ± 50 (–26.2)	Cliff et al. 1995
41DT62:					
Excavation Units 2, 5, 6, 7, 11, and 14, Level 7	Beta-52602	wood charcoal	1240 ± 70	1220 ± 70 (–25.9)	Fields et al. 1993
Excavation Units 2, 7, 12, and 13, Levels 6 and 7	Beta-52605	nutshells and wood charcoal	1370 ± 110	1380 ± 110 (–24.8)	Fields et al. 1993
Excavation Units 7, 8, and 20, Level 4	Beta-52604	wood charcoal	870 ± 130	830 ± 130 (–27.3)	Fields et al. 1993
Excavation Units 7, 8, 11, 15, 17, and 19, Level 5	Beta-52603	wood charcoal	1020 ± 80	1000 ± 80 (–26.0)	Fields et al. 1993
Excavation Unit 9, Level 3	Beta-51379	wood charcoal	1790 ± 140	1790 ± 140 (–25.2)	Fields et al. 1993
41DT63:					
Test Unit 1, Level 5	Beta-46864	nutshells	1080 ± 100	1090 ± 100 (–24.1)	Gadus, Fields, and Bousman 1992
Test Unit 2, Level 4	Beta-46865	nutshells	1020 ± 90	1010 ± 90 (–25.2)	Gadus, Fields, and Bousman 1992
Test Unit 2, Level 7	Beta-46866	nutshells	940 ± 60	930 ± 60 (–25.6)	Gadus, Fields, and Bousman 1992
41DT80:					
Feature 2	SMU-1903	nutshells and wood charcoal	–	920 ± 30 (–25.8)	Cliff 1989; Haas 1989
Feature 3	SMU-1967	nutshells and wood charcoal	–	1020 ± 60 (–25.3)	Cliff 1989; Haas 1989
Feature 12	SMU-1968	nutshells and wood charcoal	–	920 ± 110 (–25.7)	Cliff 1989; Haas 1989
Feature 23	SMU-2025	nutshells	–	860 ± 30	Cliff 1989; Haas 1989

Provenience	Lab Number	Material	^{14}C Age (B.P.)	Corrected Age (B.P.)	Reference
Feature 48	SMU-1959	nutshells	–	960 ± 40 (–25.0)	Cliff 1989; Haas 1989
Square 88, 25–30 cm	Tx-1958	charcoal	1220 ± 350	–	Cliff 1989; Hyatt and Doehner 1975; Valastro et al. 1978
Square 88, 85–92 cm	Tx-1959	charcoal	1180 ± 220	–	Cliff 1989; Hyatt and Doehner 1975; Valastro et al. 1978
41DT124:					
Feature 2	SMU-2009	nutshells	–	860 ± 30	Haas 1989; Martin 1989a
Feature 4	SMU-1947	nutshells	–	1050 ± 30 (–25.5)	Haas 1989; Martin 1989a
Feature 5	SMU-1948	nutshells	–	960 ± 30 (–25.7)	Haas 1989; Martin 1989a
Feature 9	SMU-1957	nutshells and wood charcoal	–	1020 ± 30 (–25.7)	Haas 1989; Martin 1989a
Feature 14	SMU-2026	nutshells	–	860 ± 30	Haas 1989; Martin 1989a
Unit 65, Level 4	SMU-1936	nutshells	–	1090 ± 190 (–25.4)	Haas 1989; Martin 1989a
Unit 66, Level 9	SMU-1946	wood charcoal	–	1510 ± 200 (–25.8)	Haas 1989; Martin 1989a
41DT141:					
Excavation Unit 1, Level 14	Beta-41776	nutshells	1560 ± 130	1570 ± 130 (–24.5)	Gadus et al. 1991
Profile 1, 3Ab1 horizon	Beta-41774	humates	1110 ± 80	1160 ± 80 (–21.8)	Gadus et al. 1991
Profile 20, 4Ab2 horizon	Beta-17401	humates	2350 ± 70	–	Bousman et al. 1988; Gadus et al. 1991
Profile 20, 4Ab3 horizon	Beta-17402	humates	5100 ± 90	–	Bousman et al. 1988; Gadus et al. 1991
Backhoe Trench A, 2C horizon	Beta-42425	burned stump	320 ± 80	270 ± 80 (–28.1)	Gadus et al. 1991
Backhoe Trench 15, 2AB horizon	Beta-17399	humates	1100 ± 70	–	Bousman et al. 1988; Gadus et al. 1991

Provenience	Lab Number	Material	^{14}C Age (B.P.)	Corrected Age (B.P.)	Reference
Backhoe Trench 15, 4Ab1 horizon	Beta-17400	humates	2100 ± 70	–	Bousman et al. 1988; Gadus et al. 1991
41HP78:					
Feature 1	SMU-1978	wood charcoal	–	1810 ± 110 (–26.4)	Haas 1989; Martin 1989b
Posthole 1	SMU-1954	wood charcoal	–	990 ± 40 (–27.3)	Haas 1989; Martin 1989b
Posthole 3	SMU-1958	wood charcoal	–	960 ± 40 (–26.7)	Haas 1989; Martin 1989b
Hearth No. 2	Tx-1961	charcoal	2080 ± 60	–	Doehner and Larson 1978; Haas 1989; Martin 1989b
41HP102:					
Feature 97A	SMU-325	charcoal	950 ± 50	–	Doehner and Larson 1978; Gadus et al. 1991
Feature 112A	SMU-310	charcoal	870 ± 50	–	Doehner and Larson 1978; Gadus et al. 1991
Feature 112A	SMU-316	charcoal	950 ± 60	–	Doehner and Larson 1978; Gadus et al. 1991
Feature 112A	SMU-328	charcoal	850 ± 60	–	Doehner and Larson 1978; Gadus et al. 1991
Feature 115B	Tx-2043	charcoal	1010 ± 90	–	Doehner and Larson 1978; Gadus et al. 1991
Test Square 52	SMU-335	charcoal	1360 ± 140	–	Doehner and Larson 1978; Gadus et al. 1991
Test Square 72, 24 cm	Tx-2046	charcoal	1690 ± 160	–	Doehner and Larson 1978; Gadus et al. 1991
Test Square 109	SMU-338	charcoal	1070 ± 160	–	Doehner and Larson 1978; Gadus et al. 1991
Test Square 113	SMU-346	charcoal	1090 ± 100	–	Doehner and Larson 1978; Gadus et al. 1991

Provenience	Lab Number	Material	^{14}C Age (B.P.)	Corrected Age (B.P.)	Reference
Test Square 127	SMU-341	charcoal	860 ± 60	–	Doehner and Larson 1978; Gadus et al. 1991
Test Square 129, 35 cm	Tx-2049	charcoal	510 ± 90	–	Doehner and Larson 1978; Gadus et al. 1991
Test Square 130, 43 cm	Tx-2041	charcoal	970 ± 90	–	Doehner and Larson 1978; Gadus et al. 1991
Test Square 145, 52 cm	Tx-2047	charcoal	1040 ± 360	–	Doehner and Larson 1978; Gadus et al. 1991
Test Square 155	SMU-339	charcoal	1410 ± 120	–	Doehner and Larson 1978; Gadus et al. 1991
Test Square 161, 31 cm	Tx-2042	charcoal	1410 ± 920	–	Doehner and Larson 1978; Gadus et al. 1991
Test Square 177, 20–25 cm	Tx-2045	charcoal	730 ± 210	–	Doehner and Larson 1978; Gadus et al. 1991
Test Square 177, 26 cm	Tx-2048	charcoal	830 ± 110	–	Doehner and Larson 1978; Gadus et al. 1991
Test Square 219, 27 cm	Tx-2044	charcoal	680 ± 100	–	Doehner and Larson 1978; Gadus et al. 1991
41HP103:					
Test Square 3, 15–20 cm	SMU-402	charcoal	165 ± 70	–	Haas 1987
41HP105:					
Square 145, 12–19 cm	Tx-1962	charcoal	1110 ± 120	–	Valastro et al. 1978
41HP106:					
Feature 2 (Burial 2), North Rise	Beta-82911/ CAMS-20938	nutshells	1050 ± 50	1050 ± 50 (–25.4)	This report
Block A, Unit 242, Levels 4B–5A, North Rise	Beta-82917	nutshells	1880 ± 90	1870 ± 90 (–25.9)	This report
Block A, Units 247/259, Levels 4B–5A, North Rise	Beta-82916	nutshells	930 ± 50	900 ± 50 (–26.5)	This report
Block A, Unit 257, Levels 4A–4B, North Rise	Beta-82918	nutshells	1070 ± 80	1070 ± 80 (–25.4)	This report

Provenience	Lab Number	Material	^{14}C Age (B.P.)	Corrected Age (B.P.)	Reference
Block D, Unit 75, Levels 6A–6B, North Rise	Beta-82913	nutshells	1730 ± 100	1710 ± 100 (–27.6)	This report
Block D, Unit 87, Levels 3B–4A, North Rise	Beta-82914	nutshells	1820 ± 90	1810 ± 90 (–25.4)	This report
Block E, Unit 94, Level 4A, North Rise	Beta-82915/ CAMS-20939	nutshells	1820 ± 50	1840 ± 50 (–24.1)	This report
Feature 36 (Burial 5), South Rise	Beta-82912	nutshells	750 ± 80	710 ± 80 (–27.6)	This report
Feature 83B, South Rise	Beta-82909/ CAMS-20937	nutshells	630 ± 50	610 ± 50 (–26.4)	This report
Feature 89, South Rise	Beta-82910	nutshells	620 ± 70	610 ± 70 (–25.7)	This report
Block B/C, Unit 57, Level 3B, South Rise	Beta-82922	nutshells	940 ± 100	930 ± 100 (–25.4)	This report
Block B/C, Unit 68, Levels 3A-3B, South Rise	Beta-82920	nutshells	690 ± 80	680 ± 80 (–25.6)	This report
Block B/C, Units 134/135/ 142/143, Level 3A, South Rise	Beta-82919	nutshells	620 ± 60	610 ± 60 (–25.4)	This report
Block B/C, Unit 187, Level 4A, South Rise	Beta-82921	nutshells	870 ± 60	850 ± 60 (–25.9)	This report
Feature 62, Southwest Rise	Beta-85868	nutshells	1910 ± 50	1890 ± 50 (–26.2)	This report
Feature 64, Southwest Rise	Beta-83089	wood charcoal	2830 ± 70	2800 ± 70 (–27.2)	This report
Feature 71, Southwest Rise	Beta-85867	wood charcoal	2270 ± 50	2250 ± 50 (–26.7)	This report
Feature 91, Southwest Rise	Beta-85866	nutshells	1860 ± 50	1860 ± 50 (–24.6)	This report
41HP116:					
Backhoe Trench 2, Profile 6, 28–56 cm (Zone III)	Beta-18512	humates	520 ± 70	–	Perttula 1988
41HP118:					
Backhoe Trench 5A, 220 cm	SMU-1883	wood charcoal	–	2860 ± 70 (–35.0)	Haas 1989; McGregor et al. 1989
Backhoe Trench 5A, 2A2b horizon	SMU-1970	humates	–	2980 ± 30 (–21.5)	Haas 1989; McGregor et al. 1989

Provenience	Lab Number	Material	^{14}C Age (B.P.)	Corrected Age (B.P.)	Reference
41HP137:					
Feature 1	SMU-1966	nutshells	–	1460 ± 60 (–25.2)	Haas 1989; McGregor 1989
Feature 2	SMU-1917	nutshells	–	2090 ± 30 (–25.7)	Haas 1989; McGregor 1989
41HP154:					
Backhoe Trench 36, Cn horizon (50–60 cm)	Beta-17404	humates	1000 ± 60	–	Bousman et al. 1988
Backhoe Trench 36, Cn horizon (220–230 cm)	Beta-17405	humates	4190 ± 80	–	Bousman et al. 1988
41HP155:					
Excavation Unit 1, Level 13	Beta-42427	wood charcoal	900 ± 130	860 ± 130 (–27.7)	Gadus et al. 1991
Profile 47, 2C2 horizon	Beta-41777/ ETH-7557	wood charcoal	–	2835 ± 95	Gadus et al. 1991
Profile 47, 2C2 horizon	Beta-41778	humates	4180 ± 80	4250 ± 80 (–20.6)	Gadus et al. 1991
Profile 47, 4Ab horizon	Beta-17413	humates	6790 ± 120	–	Bousman et al. 1988; Gadus et al. 1991
Backhoe Trench 42, 4Ab horizon	Beta-17411	humates	3850 ± 110	–	Bousman et al. 1988; Gadus et al. 1991
Backhoe Trench 42, 5C horizon	Beta-17412	humates	9830 ± 170	–	Bousman et al. 1988; Gadus et al. 1991
Roadcut, 200 cm	SMU-2292	wood charcoal	–	1080 ± 60 (–26.1)	Gadus et al. 1991; Jurney and Bohlin 1993
41HP159:					
Feature 1	SMU-2222	wood charcoal	–	4800 ± 90 (–25.8)	Gadus, Fields, Bousman, and Howard 1992; Jurney and Bohlin 1993
Feature 4	GX-15877	wood charcoal	–	100.5 ± 2.8% of modern	Gadus, Fields, Bousman, and Howard 1992
Feature 12	GX-15878-AMS	wood charcoal	–	4490 ± 70 (–24.1)	Gadus, Fields, Bousman, and Howard 1992

Provenience	Lab Number	Material	^{14}C Age (B.P.)	Corrected Age (B.P.)	Reference
Excavation Unit 20, Bt horizon	GX-15917	humates	–	1995 ± 230 (–18.9)	Gadus, Fields, Bousman, and Howard 1992
Excavation Unit 31, 60–70 cm	GX-15879-AMS	wood charcoal	–	530 ± 50 (–26.3)	Gadus, Fields, Bousman, and Howard 1992
Excavation Unit 43, 170–180 cm	GX-15880-AMS	wood charcoal	–	4990 ± 70 (–26.0)	Gadus, Fields, Bousman, and Howard 1992
Excavation Unit 45, 180–190 cm	GX-15881-AMS	wood charcoal	–	5540 ± 70 (–25.5)	Gadus, Fields, Bousman, and Howard 1992
Deep Probe Trench, 3Akb horizon	GX-15912	humates	–	7815 ± 410 (–19.6)	Gadus, Fields, Bousman, and Howard 1992
Deep Probe Trench, 4Akb horizon	GX-15913	humates	–	9390 ± 505 (–21.2)	Gadus, Fields, Bousman, and Howard 1992
Deep Probe Trench, 5Ab horizon	GX-15914	humates	–	8940 ± 365 (–18.6)	Gadus, Fields, Bousman, and Howard 1992
Deep Probe Trench, 6Agkb horizon	GX-15915	humates	–	10,820 ± 620 (–24.1)	Gadus, Fields, Bousman, and Howard 1992
Profile 1, 2Abl horizon	GX-15916	humates	–	3310 ± 190 (–18.1)	Gadus, Fields, Bousman, and Howard 1992
Profile 3, channel fill	GX-15918	humates	–	355 ± 120 (–24.5)	Gadus, Fields, Bousman, and Howard 1992
41HP168:					
Backhoe Trench 95, 124 cm	SMU-2291	wood	–	70 ± 50 (–25.1)	Jurney and Bohlin 1993
150–168 cm	SMU-2287	wood	–	490 ± 170 (–25.9)	Jurney and Bohlin 1993
41HP175:					
Feature 1	Beta-52246	nutshells	640 ± 80	630 ± 80 (–25.8)	Fields et al. 1993
Feature 1	Beta-51382	nutshells	780 ± 50	780 ± 50 (–25.1)	Fields et al. 1993
Feature 3	Beta-51383	wood charcoal	400 ± 70	390 ± 70 (–25.7)	Fields et al. 1993

Provenience	Lab Number	Material	^{14}C Age (B.P.)	Corrected Age (B.P.)	Reference
Feature 8	Beta-51385	wood charcoal	890 ± 70	860 ± 70 (–26.8)	Fields et al. 1993
Excavation Unit 22, Level 2	Beta-51386	nutshells	500 ± 60	470 ± 60 (–27.2)	Fields et al. 1993
Excavation Unit 33, Level 2	Beta-51387	nutshells	560 ± 70	540 ± 70 (–26.6)	Fields et al. 1993
Excavation Unit 36, Level 2	Beta-51388	nutshells	510 ± 70	490 ± 70 (–25.9)	Fields et al. 1993
Excavation Unit 43, Level 3	Beta-51389	nutshells	400 ± 70	380 ± 70 (–26.5)	Fields et al. 1993
Excavation Unit 74, Level 2	Beta-51390	nutshells	520 ± 80	490 ± 80 (–26.9)	Fields et al. 1993
Excavation Unit 70, Level 2	Beta-51391	nutshells	410 ± 80	390 ± 80 (–26.4)	Fields et al. 1993
Excavation Unit 83, Level 3	Beta-51392	nutshells	480 ± 70	470 ± 70 (–26.2)	Fields et al. 1993
Profile A, 2A horizon	Beta-48210	humates	880 ± 60	890 ± 60 (–24.3)	Fields et al. 1993
Profile A, 3A horizon	Beta-48211	humates	3450 ± 60	3620 ± 60 (–14.7)	Fields et al. 1993
Backhoe Trench 28, 3A horizon	Beta-48212	humates	9570 ± 110	9710 ± 110 (–16.5)	Fields et al. 1993
Trackhoe Trench, channel fill	Beta-48864/ ETH-8896	wood charcoal	–	590 ± 60	Fields et al. 1993
Trackhoe Trench, backdirt	SMU-2326	charcoal	–	210 ± 60 (–26.8)	Jurney and Bohlin 1993
Locality 18:					
Backhoe Trench 27, Cca horizon	Beta-17403	humates	13,300 ± 200	–	Bousman et al. 1988
Locality 20:					
Backhoe Trench 49, 2Ab horizon	Beta-17414	humates	950 ± 70	–	Bousman et al. 1988
Backhoe Trench 49, 3Ab horizon	Beta-17415	humates	2420 ± 60	–	Bousman et al. 1988
Locality 21:					
Backhoe Trench 37, Cn horizon	Beta-17406	humates	3570 ± 120	–	Bousman et al. 1988
Backhoe Trench 38, Cn horizon	Beta-17407	humates	1500 ± 90	–	Bousman et al. 1988
Backhoe Trench 38, Cca horizon	Beta-17408	humates	7210 ± 130	–	Bousman et al. 1988
Backhoe Trench 41, Ab horizon	Beta-17409	humates	640 ± 70	–	Bousman et al. 1988
Backhoe Trench 41, Cca horizon	Beta-17410	humates	5150 ± 170	–	Bousman et al. 1988

REFERENCES CITED

Bousman, C. Britt, Michael B. Collins, and Timothy K. Perttula
1988 *Quaternary Geomorphology at Cooper Basin: A Framework for Archeological Inquiry, Delta and Hopkins Counties, Texas.* Reports of Investigations No. 55. Prewitt and Associates, Inc., Austin.

Cliff, Maynard B.
1989 Archaeological Investigations at the Thomas Site (41DT80). In *Archaeological Investigations at Cooper Lake: 1987 Season* (review draft), by Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators, pp. 6-1 through 6-145. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

Cliff, Maynard B., Melissa M. Green, Steven M. Hunt, and David Shanabrook
1995 *Archeological Test Excavations at Two Prehistoric Sites (41DT59 and 41DT247) at Cooper Lake, Delta County, Texas, 1994.* Miscellaneous Report of Investigations No. 90. Geo-Marine, Inc., Plano, Texas.

Doehner, Karen, and Richard E. Larson
1978 *Archaeological Research at the Proposed Cooper Lake, Northeast Texas, 1974–1975.* Research Report 108. Archaeology Research Program, Southern Methodist University, Dallas.

Fields, Ross C., Eloise F. Gadus, L. Wayne Klement, C. Britt Bousman, and Jerrilyn B. McLerran
1993 *Excavations at the Tick, Spike, Johns Creek, and Peerless Bottoms Sites, Cooper Lake Project, Delta and Hopkins Counties, Texas.* Reports of Investigations No. 91. Prewitt and Associates, Inc., Austin.

Fields, Ross C., Eloise F. Gadus, L. Wayne Klement, and Karen M. Gardner
1994 *Excavations at the Spider Knoll Site, Cooper Lake Project, Delta County, Texas.* Reports of Investigations Number 96. Prewitt and Associates, Inc., Austin.

Gadus, Eloise F., Ross C. Fields, and C. Britt Bousman
1992 *Archeological Investigations at 41DT11, 41DT21, 41DT50, 41DT54, and 41DT63 at Cooper Lake, Delta County, Texas.* Reports of Investigations No. 86. Prewitt and Associates, Inc., Austin.

Gadus, Eloise F., Ross C. Fields, C. Britt Bousman, and Margaret A. Howard
1992 *Excavations at the Finley Fan Site, 41HP159, Hopkins County, Texas.* Reports of Investigations No. 78. Prewitt and Associates, Inc., Austin.

Gadus, Eloise F., Ross C. Fields, L. Wayne Klement, C. Britt Bousman, Margaret A. Howard, and Karen M. Gardner
1991 *Testing, Revisitation, and Evaluation of Selected Sites at Cooper Lake, Delta and Hopkins Counties, Texas.* Reports of Investigations No. 81. Prewitt and Associates, Inc., Austin.

Haas, Herbert
1987 Southern Methodist University Radiocarbon Date List III. *Radiocarbon* 29(2):209–238.

1989 Radiocarbon Dating of Samples. In *Archaeological Investigations at Cooper Lake: 1987 Season* (review draft), by Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators, pp. I-1 through I-6. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

Hyatt, Robert D., and Karen Doehner
1975 *Archaeological Research at Cooper Lake, Northeast Texas, 1973.* Contributions in Anthropology No. 15. Southern Methodist University, Dallas.

Jurney, David H., and Jeffery Bohlin
1993 *Archaeological Survey of Cooper Lake, Delivery Order Number 6, 1989.* Archaeology Research Program, Department of Anthropology, Southern Methodist University, Dallas.

Martin, William A.
1989a Archaeological Investigations at the Doctors Creek Site (41DT124). In *Archaeological Investigations at Cooper Lake: 1987 Season* (review draft), by Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators, pp. 7-1 through 7-110. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

1989b Archaeological Investigations at the Lawson Site (41HP78). In *Archaeological Investigations at Cooper Lake: 1987 Season* (review draft), by Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators, pp. 9-1 through 9-93. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

McGregor, Daniel E.
1989 Excavations at Site 41HP137. In *Archaeological Investigations at Cooper Lake: 1987 Season* (review draft), by Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators, pp. 8-1 through 8-28. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

McGregor, Daniel E., William A. Martin, and Maynard B. Cliff
1989 Site Descriptions of Tested Prehistoric Sites. In *Archaeological Investigations at Cooper Lake: 1987 Season* (review draft), by Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators, pp. 3-1 through 3-124. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

Perttula, Timothy K.
1988 *Cultural Resources Survey at Cooper Lake, Delta and Hopkins Counties, Texas*. Institute of Applied Sciences, The University of North Texas, Denton.

Valastro, S., Jr., E. Mott Davis, and Alejandra G. Varela
1978 University of Texas at Austin Radiocarbon Dates XII. *Radiocarbon* 21(2):245–273.

APPENDIX C: Radiocarbon Dates from the Hurricane Hill Site (41HP106)

Timothy K. Perttula

One of the last remaining (if not the last) tasks in the long history of archeological investigations at Cooper Lake is the completion of the report on the 1986–1987 excavations at the Hurricane Hill site (41HP106). As discussed in this synthesis volume, Hurricane Hill was a large aboriginal site that sat astride the dam embankment for Cooper Lake. Extensive excavations there disclosed substantial late Archaic, Early Ceramic (termed Woodland elsewhere in this report), and early to middle Caddoan period occupations with middens, pit features, burials, portions of five Caddoan structures, and a large material culture and ecofactual record (Perttula n.d.).

For various reasons, the report of investigations has not been completed in a timely manner (the draft report probably will be submitted to the Corps of Engineers, Fort Worth District in 1997), hindering the full use of the archeological findings in the most recent archeological work at Cooper Lake. To help rectify the situation, as part of the synthesis volume effort and with the support of Prewitt and Associates, Inc. and the Corps of Engineers, Fort Worth District, 18 radiocarbon dates have recently been obtained from various midden and feature contexts at Hurricane Hill (Table 14). In this appendix, I present the results of the radiocarbon assays and offer age estimates for the major occupations at the site. Documentation of the contexts from which these samples came will be presented in the full report on Hurricane Hill.

My interpretations of the radiocarbon dates are based on (a) the intrasite provenience and context of the radiocarbon samples, particularly midden and feature relationships, and (b) artifact associations. I discuss the results by natural rise, because each rise appears to have had a different occupational history.

Assays Beta-82913, 82914, 82915, and 82917 from midden contexts in Blocks A, D, and E on the North Rise date an Early Ceramic period deposit termed the primary midden (Perttula n.d.); this midden covered the entire North Rise. In terms of probabilities, the age span of the primary midden is A.D. 59–449. The most common diagnostic Early Ceramic period artifacts on the North Rise are the Gary *var. LeFlore* and *Camden* dart point forms, which Schambach (1982) dates to 450 B.C.–A.D. 250 and A.D. 250–700, respectively.

Overlying the primary midden in two areas of the North Rise are two small Caddoan middens labeled middens 1 and 2. Much of Block A is within Caddoan midden 1, and the two radiocarbon dates from this context (Beta-82916 and 82918) are A.D. 1154–1213 (relative area under probability distribution = 0.45, but the relative area under the probability distribution is 0.65 for A.D. 1117–1213) and A.D. 882–1039. Feature 2, an extended Caddoan burial at the south edge of the North Rise (with no grave goods but abundant sherds from midden 2 fill), dates to A.D. 959–1029; this is contemporaneous with Beta-82918. Based on these three dates and the abundance of Alba, Scallorn, and Steiner arrow points and Pennington Punctated Incised and Crockett Curvilinear Incised ceramics on the North Rise, these three dates pertain to the early Caddoan period (ca. A.D. 1000–1200) use of this part of the Hurricane Hill site. Presumably, the two structures there (Structures D and E) date to this period as well. The two thermoluminescence dates on Caddoan ceramics from midden 1 are A.D. 1210 ± 90 (45 cm below the surface) and A.D. 1370 ± 100 (25 cm below the surface) (Perttula n.d.:Table 7-1), which appear to be too recent.

The South Rise dates are from the following contexts: two small pits (Features 83B and 89) some 10–20 m from two overlapping Caddoan structures (Structures A and B); Feature 36, an extended Caddoan burial in a pit associated with the earlier structure (B); nutshells thought to be associated with floor deposits of Structure A (Beta-82919 and 82920); and nutshells from contexts associated with Structure B (Beta-82921 and 82922). The artifacts (such as Hayes and Bonham arrow points and Sanders Plain, Sanders Engraved, and Maxey Noded Redware ceramics) and an archeomagnetic date of A.D. 1300 ± 50 on the central hearth of Structure A suggest that the main Caddoan component on the South Rise dates to the middle Caddoan period (A.D. 1200–1400).

The dates cluster readily into two groups. The first group (Beta-82921 and 82922), thought to be associated with Structure B, spans the period A.D. 1024–1275. The other date from a Structure B context is A.D. 1248–1319, the Feature 36 burial. Beta-82922 does not appear to be a useful radiocarbon assay, for it implies that Structure B predates Structure A (see below) by at least 100 years (and possibly as many as 280 years), when the archeological evidence of central hearth and posthole pattern superpositioning is much more consistent with Structures A and B dating to within one or two generations of each other. With the radiocarbon dates at hand, I suggest that Structure B dates from

TABLE 14

RADIOCARBON ASSAYS FROM THE HURRICANE HILL SITE

Provenience	Sample No.	^{14}C Age (B.P.)	Corrected Age (B.P.)**	Calibrated Date Range (1-sigma)***
NORTH RISE				
Feature 2	Beta-82911*	1050 ± 50	1050 ± 50 (–25.4)	A.D. 959–1029 (0.91) A.D. 897–909 (0.09)
Unit 75, Levels 6A–6B	Beta-82913	1730 ± 100	1710 ± 100 (–27.6)	A.D. 218–449 (0.99) A.D. 488–493 (0.01)
Unit 87, Levels 3B–4A	Beta-82914	1820 ± 90	1810 ± 90 (–25.4)	A.D. 123–269 (0.72) A.D. 272–337 (0.28)
Unit 94, Level 4A	Beta-82915*	1820 ± 50	1840 ± 50 (–24.1)	A.D. 127–242 (1.00)
Unit 247/259, Levels 4B–5A	Beta-82916	930 ± 50	900 ± 50 (–26.5)	A.D. 1154–1213 (0.45) A.D. 1048–1093 (0.35) A.D. 1117–1143 (0.20)
Unit 242, Levels 4B–5A	Beta-82917	1880 ± 90	1870 ± 90 (–25.9)	A.D. 59–253 (0.96) A.D. 303–314 (0.04)
Unit 257, Levels 4A–4B	Beta-82918	1070 ± 80	1070 ± 80 (–25.4)	A.D. 882–1039 (1.00)
SOUTH RISE				
Feature 83B	Beta-82909*	630 ± 50	610 ± 50 (–26.4)	A.D. 1307–1360 (0.71) A.D. 1379–1400 (0.29)
Feature 89	Beta-82910	620 ± 70	610 ± 70 (–25.7)	A.D. 1306–1365 (0.69) A.D. 1374–1402 (0.31)
Feature 36	Beta-82912	750 ± 80	710 ± 80 (–27.6)	A.D. 1248–1319 (0.62) A.D. 1342–1392 (0.38)
Unit 142–145, Level 3A	Beta-82919	620 ± 60	610 ± 60 (–25.4)	A.D. 1306–1363 (0.70) A.D. 1376–1401 (0.30)
Unit 68, Levels 3A–3B	Beta-82920	690 ± 80	680 ± 80 (–25.6)	A.D. 1335–1394 (0.56) A.D. 1280–1325 (0.44)
Unit 187, Level 4A	Beta-82921	870 ± 60	850 ± 60 (–25.9)	A.D. 1159–1275 (0.93) A.D. 1065–1074 (0.04) A.D. 1127–1133 (0.03)
Unit 57, Level 3B	Beta-82922	940 ± 100	930 ± 100 (–25.4)	A.D. 1024–1205 (1.00)

NOTE: All assays are on charred nutshells except Beta-83089 and 85867, which are on wood charcoal.

*Accelerator Mass Spectrometry assays

**Ages not calibrated; δ^{13}C values in parenthesis

***Calibrations use bidecadal record of Stuiver and Reimer (1993; Radiocarbon Calibration Program Version 3.0.3c); probability distributions are in parentheses.

Table 14, continued

Provenience	Sample No.	^{14}C Age (B.P.)	Corrected Age (B.P.)	Calibrated Date Range (1-sigma)
SOUTHWEST RISE				
Feature 64	Beta-83089	2830 ± 70	2800 ± 70 (–27.2)	1007–890 B.C. (0.77) 889–845 B.C. (0.23)
Feature 91	Beta-85866*	1860 ± 50	1860 ± 50 (–24.6)	A.D. 118–232 (1.00)
Feature 71	Beta-85867*	2270 ± 50	2250 ± 50 (–26.7)	307–207 B.C. (0.79) 377–352 B.C. (0.21)
Feature 62	Beta-85868*	1910 ± 50	1890 ± 50 (–26.2)	A.D. 78–148 (0.64) A.D. 161–210 (0.36)

the mid thirteenth century to the beginning of the fourteenth century.

The second South Rise group of four dates ranges from A.D. 1306–1394; three cluster between A.D. 1306 and 1365. They include the two extramural pits and the nutshells from the floor of Structure A. These radiocarbon assays indicate that Caddoan Structure A on the South Rise, and associated extramural work areas, was probably built and used through the first half or three-quarters of the fourteenth century.

The six thermoluminescence dates from the South Rise range from A.D. 1020 ± 120 to A.D. 1540 ± 60. Given the interpretation from the radiocarbon dates and the artifacts that the South Rise was occupied primarily by Caddoan peoples at ca. A.D. 1250–1375 and the fact that only two of the thermoluminescence dates (both probably associated with Structure A) fall within this range, it seems reasonable to conclude that the thermoluminescence dates are less reliable than the calibrated radiocarbon dates on charred nutshells.

Four radiocarbon dates have been obtained from the Southwest Rise. This area of the site contained substantial late Archaic and Early Ceramic period midden deposits, pit and hearth features, and a small cemetery with cremations and bundle burials (Perttula 1995). The most common diagnostic artifact in the Southwest Rise archeological deposits is the Gary *var. Gary* dart point, estimated to date from ca. 850–450 B.C. (Schambach 1982), followed by the Gary *var. LeFlore* point type.

The oldest radiocarbon date (Beta-83089) is from wood charcoal in the fill of Feature 64, a large pit with more than 2,500 g of cremated bones (from several individuals), seven stacked unburned long bones, a small pile of unburned teeth, 667 pieces of lithic debris, 11 g of burned clay, 59 fire-cracked rocks, and a broken bifacially worked lithic tool. At one or two standard deviations using Method B (1007–890 B.C. and 1121–813 B.C., respectively), and given the estimated dates of the two most common Gary point types on the Southwest Rise, the Feature 64 calibrated date seems to be too old. Of course, it is possible that the charcoal originated in older midden deposits, but this seems unlikely given the calibrated ages of Features 62, 71, and 91, which indicate midden deposition and feature use during two periods, 307–207 B.C. (Feature 71) and A.D. 78–232 (Features 62 and 91). This latter period of use on the Southwest Rise is contemporaneous with the primary midden on the North Rise. These pit features contained midden deposits and/or organically rich fill, and two of the three pits are within the midden while the third (Feature 91) is 3 m to the south (Perttula 1995:Figure 3). All three of the features contained some amounts of lithic debris, burned clay, and fire-cracked rocks, and a Gary *var. LeFlore* dart point was recovered in Feature 62.

The four dates from the Southwest Rise indicate a lengthy, but apparently only periodic, use of the landform. Three of the dates fall within a span of time when fairly substantial midden and feature deposits are known to occur widely throughout the basin (e.g., 41DT6, 41DT16, 41DT62, 41HP78, 41HP102, and 41HP137), but only the prehistoric occupation at 41DT59 (Cliff et al. 1995) is contemporaneous with the 1007–890 B.C. age for the

Feature 64 cremation. Unfortunately, the dates obtained from the Southwest Rise at Hurricane Hill do not fully clarify the age and span of use of the prehistoric cemetery, and additional radiocarbon samples will be submitted from burial contexts in the near future.

ACKNOWLEDGMENTS

I would first like to thank Ross Fields for suggesting that radiocarbon samples be processed from the Hurricane Hill site and then paying for 15 of the assays under Prewitt and Associates Cooper Lake contract with the Corps of Engineers, Fort Worth District. Bo Nelson was of considerable assistance in procuring the samples from the University of North Texas. He also quickly sorted and tabulated the charred nutshells used for the radiocarbon samples, helping greatly to move the dating project along.

REFERENCES CITED

Cliff, Maynard B., Melissa M. Green, Steven M. Hunt, and David Shanabrook
1995 *Archeological Test Excavations at Two Prehistoric Sites (41DT59 and 41DT247) at Cooper Lake, Delta County, Texas, 1994.* Miscellaneous Report of Investigations No. 90. Geo-Marine, Inc., Plano, Texas.

Perttula, Timothy K.
1995 Early Ceramic Settlement in Northeast Texas: Archeological Investigations of the Hurricane Hill Site (41HP106), Cooper Lake, Northeast Texas. In *Advances in Texas Archeology: Contributions from Cultural Resource Management, Volume I,* edited by James E. Bruseth and Timothy K. Perttula, pp. 131–154. Department of Antiquities Protection Cultural Resource Management Report 5. Texas Historical Commission, Austin.

n.d. *The Hurricane Hill Site, 41HP106.* Special Publication No. 2, Friends of Northeast Texas Archaeology, and Contributions in Archaeology No. 9, Institute of Applied Sciences, University of North Texas. In preparation.

Schambach, Frank F.
1982 An Outline of Fourche Maline Culture in Southwest Arkansas. In *Arkansas Archeology in Review*, edited by Neal L. Trubowitz and Marvin D. Jeter, pp. 132–197. Research Series No. 15. Arkansas Archeological Survey, Fayetteville.

Stuiver, Minze, and Paula J. Reimer
1993 Extended ^{14}C Data Base and Revised CALIB 3.0 ^{14}C Age Calibration Program. *Radiocarbon* 35(1):215–230.

APPENDIX D: Analysis of Human Remains from Cooper Lake

Diane Wilson

and

D. Gentry Steele

INTRODUCTION

This review of the human skeletal remains recovered from Cooper Lake has two principle objectives. The first is to provide a written report of an osteological examination conducted by researchers at Geo-Marine, Inc., on skeletal remains recovered from sites 41DT6, 41DT80, 41DT124, 41HP78, 41HP102, 41HP105, and 41HP106. The remains recovered from these sites were examined following standard osteological procedures outlined by Buikstra and Ubelaker (1994), and the information gleaned from each burial was recorded on a standard osteological form. The data reported on these forms provide the information used for the analysis presented here.

The second objective is to provide a synthetic review incorporating this new information with bioarcheological information previously published on human remains recovered from Cooper Lake. The previously published reports include information on burials from the seven sites listed above, as well as two additional sites: 41DT1 and 41DT16. Table 15 provides a list of all burials and sites considered here, the source for the information presented, the archeological context of the burials, and the burial pattern documented for each interment.

The analysis of the new information on the skeletal remains and the synthesis of the published data provide an inventory of the remains recovered from Cooper Lake and address issues concerning the state of preservation of the remains, the demographic structure of the population, the body size and sexual dimorphism of the prehistoric population that resided in the Cooper Lake area, an evaluation of the population's diet and health, and an assessment of their biological affinity to other populations within the region. One difficulty faced in the analysis and review is the inequality of the data sets. Information provided in each of the published papers is not the same, and this information is not in many cases as complete or as detailed as the information available on the Geo-Marine coding forms. Therefore, it has been necessary at times to use the published information as one data set (the "reviewed" data) and the information from the coding forms as a second, more-detailed data set (the "examined" data). Where possible, the "reviewed" data have been added to the tables in this appendix. This could not be done in many cases, however, and thus some of the burials listed in Table 15 do not appear on subsequent tables.

INVENTORY

Establishing an inventory of the individuals in the assemblages and the material representing each individual was the prerequisite to the osteological analysis. The inventory served as a description of remains present and was useful in assessments of preservation, mortuary patterns, bioturbation and other postmortem disturbances, excavation conditions and techniques, and soil conditions.

Nine sites containing human burials have been reported for Cooper Lake. Determining the number of burials per site, however, is problematic in some cases. For the sites considered in this report, 55 of the burials are reported as single interments. Four burials (two from 41DT16, one from 41DT80, and one from 41HP102) contained the remains of two individuals, and six burials from 41HP106 contained the remains of an unspecified number of individuals greater than one. Assuming that at least 2 individuals were represented in the multiple burials, then a minimum of 75 individuals have been recovered from Cooper Lake.

The number of individuals recovered per site ranges from 2 to minimally as many as 27. Two to 7 individuals were recovered from seven sites, and 15 and at least 27 individuals were recovered from sites 41HP102 and 41HP106, respectively. The mean number of individuals per site is 8.3. This figure is comparable to the mean number of burials reported for Caddoan sites in other regions and for prehistoric populations in adjacent areas of Texas. Rose and Burnett (1990) list 8.7 individuals as the mean number of burials per Caddoan site in the eastern portion of the Gulf Coastal Plain, which includes Cooper Lake as well as additional nearby counties in Texas, Oklahoma, and Arkansas. Steele and Olive (1989) report 8.5 as the mean number of individuals per site for the western portion of the Gulf Coastal Plain, with 3.6 individuals per site for this region if cemetery sites are excluded and only occupation sites are considered.

Story et al. (1990:427) propose that most of the Cooper Lake occupations fall within their adaptive category of Sedentary/Intensive Gardeners. Based upon this model, then, the Cooper Lake occupations should be larger and contain more interments than either temporally older occupations of a different adaptive type or Foragers/Gatherers-Hunters from

TABLE 15

SUMMARY OF THE HUMAN BURIALS RECOVERED FROM COOPER LAKE

Site	Burial	Reference	Reanalyzed by Geo-Marine	Age	Rationale for Age Assessment	Burial Pattern
41DT1	Burial 1	Johnson 1962; Wilson and Steele 1996	no	early Caddoan or Woodland	site has a strong early Caddoan component, and the human remains most likely date to this period; earlier components are present as well, however, and it is possible that the human remains are of Woodland age	possibly flexed; head to E; on right side
	Burial 2	Johnson 1962	no	early Caddoan or Woodland	site has a strong early Caddoan component, and the human remains most likely date to this period; earlier components are present as well, however, and it is possible that the human remains are of Woodland age	unknown
	Burial 3	Johnson 1962	no	early Caddoan or Woodland	site has a strong early Caddoan component, and the human remains most likely date to this period; earlier components are present as well, however, and it is possible that the human remains are of Woodland age	unknown
	Burial 4	Johnson 1962	no	early Caddoan or Woodland	site has a strong early Caddoan component, and the human remains most likely date to this period; earlier components are present as well, however, and it is possible that the human remains are of Woodland age	semiflexed; head to SW; on right side
	Burial 1 (SMU)	Hyatt and Doehner 1975; Westbury 1975, 1978	no	early Caddoan or Woodland	site has a strong early Caddoan component, and the human remains most likely date to this period; earlier components are present as well, however, and it is possible that the human remains are of Woodland age	unknown
41DT6	—	Harris 1955	no	early Caddoan or Woodland	site has strong early Caddoan and Woodland components; given that the burial was removed by avocationals and little is known of its context, it cannot be assigned to one period or the other	flexed; head to W; on right side
	Burial 1 (Feature 8A)	Doehner and Larson 1978; Westbury 1978	yes	early Caddoan	site has strong early Caddoan and Woodland components; given that the burial was found at 8 cm below the surface, it probably goes with the later component	possibly flexed; head to S; on left side

Table 15, continued

Site	Burial	Reference	Reanalyzed by Geo-Marine	Age	Rationale for Age Assessment	Burial Pattern
41DT6, cont'd.	Burial 2 (Feature 10A)	Doehner and Larson 1978; Westbury 1978	yes	early Caddoan	site has strong early Caddoan and Woodland components; given that the burial was found at 18 cm below the surface, it probably goes with the later component	extended; head to SE
	Burial 3 (Feature 6A)	Doehner and Larson 1978; Westbury 1978	yes	early Caddoan or Woodland	site has strong early Caddoan and Woodland components; the burial was found at 40 cm below the surface in probable Woodland deposits, but it is possible that it was in a pit intrusive from above	extended; head to SE
	Feature 1	Fields et al. 1993; Derrick and Steele 1993	no	early Caddoan or Woodland	1991 block sampled both Woodland and early Caddoan components; this burial was in the Woodland deposits, but given that most of it was removed by the backhoe, it is not certain that it was not intrusive from later deposits	probably flexed; head to S; on right side
41DT16	—	Hatzenbuehler 1953	no	early Caddoan or Woodland	site has predominantly early Caddoan and Woodland deposits; burial was removed by avocationals, and hence context is uncertain	flexed; head to N; on right side
	Feature 6	Fields et al. 1993; Derrick and Steele 1993	no	early Caddoan	burial was in deposits dated securely to the early Caddoan period	2 individuals; extended; head to NE
	Feature 7	Fields et al. 1993; Derrick and Steele 1993	no	early Caddoan	burial was in deposits dated securely to the early Caddoan period	2 individuals; 1 possibly flexed with head to E; other unknown
41DT80	Burial 1 (Feature 2)	Hyatt et al. 1974; Westbury 1975, 1978	yes	early Caddoan	dates and diagnostic artifacts indicate that the site dates predominantly to the early Caddoan period	flexed; head to N; on left side
	Burial 2	Hyatt and Doehner 1975; Westbury 1975, 1978	yes	early Caddoan	dates and diagnostic artifacts indicate that the site dates predominantly to the early Caddoan period	unknown

Table 15, continued

Site	Burial	Reference	Reanalyzed by Geo-Marine	Age	Rationale for Age Assessment	Burial Pattern
41DT80, cont'd.	Burial 3 (Feature 51)	Cliff 1989; Burnett and Harmon 1989	yes	early Caddoan	dates and diagnostic artifacts indicate that the site dates predominantly to the early Caddoan period	extended; head to NE
	Burial 4 (Feature 52)	Cliff 1989; Burnett and Harmon 1989	yes	early Caddoan	dates and diagnostic artifacts indicate that the site dates predominantly to the early Caddoan period	flexed; head to SW; on left side
	Burial 5 (Feature 53)	Cliff 1989; Burnett and Harmon 1989	no	early Caddoan	dates and diagnostic artifacts indicate that the site dates predominantly to the early Caddoan period	2 individuals; 1 probably flexed with head to SSE, on right side; other unknown
	Burial 6	Cliff 1989; Burnett and Harmon 1989	yes	early Caddoan	dates and diagnostic artifacts indicate that the site dates predominantly to the early Caddoan period	extended; head to ENE
41DT124	Burial 1 (Feature 32)	Martin 1989a; Burnett and Harmon 1989	no	early Caddoan	the burial might be in Woodland-age deposits, but the pit originated in the upper levels of the Burial Block where early Caddoan materials predominate	flexed; no other details given
	Burial 2 (Feature 19)	Martin 1989a; Burnett and Harmon 1989	yes	early Caddoan	dates and diagnostic artifacts indicate that the Midden Block area dates predominantly to the early Caddoan period	extended; oriented E-W, but direction of head not given
41HP78	Burial 1 (Feature 1)	Martin 1989b; Burnett and Harmon 1989	no	early Caddoan or Woodland	the fill yielded a Woodland date, but Rise I contains a strong early Caddoan component and the date may not relate to actual interment	flexed; head to SE; on left side
	Burial 2 (Feature 2)	Martin 1989b	no	early Caddoan or Woodland	the site apparently has strong early Caddoan and Woodland components, but they cannot be separated	unknown
	Burial 3	Martin 1989b; Burnett and Harmon 1989	yes	early Caddoan or Woodland	the site apparently has strong early Caddoan and Woodland components, but they cannot be separated	flexed; head to W; on right side

Table 15, continued

Site	Burial	Reference	Reanalyzed by Geo-Marine	Age	Rationale for Age Assessment	Burial Pattern
41HP78, cont'd.	Burial 4	Martin 1989b; Burnett and Harmon 1989	no	early Caddoan or Woodland	the site apparently has strong early Caddoan and Woodland components, but they cannot be separated	flexed; head to S; on right side
	Burial 5 (Feature 20)	Martin 1989b; Burnett and Harmon 1989	no	probably Woodland	the site apparently has strong early Caddoan and Woodland components, but they cannot be separated; Woodland assessment based on the fact that this is a cremation	cremation
	Burial 6 (Feature 24)	Martin 1989b; Burnett and Harmon 1989	no	early Caddoan or Woodland	the site apparently has strong early Caddoan and Woodland components, but they cannot be separated	extended; oriented E-W, but direction of head not given
41HP102	Burial 1 (Feature 68A)	Doehner and Larson 1978; Westbury 1978	yes	early Caddoan or Woodland	dates and diagnostic artifacts show that the northern part of the site may have substantial late Woodland deposits as well as early Caddoan materials, and this burial could date to either period	semiflexed; head to SE; on left side
	Burial 2 (Feature 131A/131B)	Doehner and Larson 1978; Westbury 1978	yes	early Caddoan	dates and diagnostic artifacts show that the predominant component in this part of the site is early Caddoan	2 individuals; unknown
	Burial 3 (Feature 132A)	Doehner and Larson 1978; Westbury 1978	yes	early Caddoan	dates and diagnostic artifacts show that the predominant component in this part of the site is early Caddoan	extended; head to SW
	Burial 4 (Feature 133A)	Doehner and Larson 1978; Westbury 1978	yes	early Caddoan	dates and diagnostic artifacts show that the predominant component in this part of the site is early Caddoan	flexed; head to SW; on left side
	Burial 5 (Feature 145B)	Doehner and Larson 1978; Westbury 1978	yes	early Caddoan	dates and diagnostic artifacts show that the predominant component in this part of the site is early Caddoan	flexed; head to SW; on left side
	Burial 6 (Feature 145C)	Doehner and Larson 1978; Westbury 1978	yes	early Caddoan	dates and diagnostic artifacts show that the predominant component in this part of the site is early Caddoan	semiflexed; head to E; on left side

Table 15, continued

Site	Burial	Reference	Reanalyzed by Geo-Marine	Age	Rationale for Age Assessment	Burial Pattern
41HP102, cont'd.	Burial 7 (Feature 146A)	Doehner and Larson 1978; Westbury 1978	yes	early Caddoan	dates and diagnostic artifacts show that the predominant component in this part of the site is early Caddoan	unknown
	Burial 8 (Feature 147A)	Doehner and Larson 1978; Westbury 1978	yes	early Caddoan	dates and diagnostic artifacts show that the predominant component in this part of the site is early Caddoan	flexed; head to SW; on right side
	Burial 9 (Feature 148A)	Doehner and Larson 1978; Westbury 1978	yes	early Caddoan	dates and diagnostic artifacts show that the predominant component in this part of the site is early Caddoan	extended; head to E
	Burial 10 (Feature 173B)	Doehner and Larson 1978; Westbury 1978	yes	early Caddoan	dates and diagnostic artifacts show that the predominant component in this part of the site is early Caddoan	flexed; head to SW; on right side
	Burial 11 (Feature 177A)	Doehner and Larson 1978; Westbury 1978	yes	early Caddoan	dates and diagnostic artifacts show that the predominant component in this part of the site is early Caddoan	extended; head to S
	Burial 12 (Feature 188A)	Doehner and Larson 1978; Westbury 1978	yes	early Caddoan	dates and diagnostic artifacts show that the predominant component in this part of the site is early Caddoan	flexed; head to SW; on right side
	Burial 13 (Feature 219A)	Doehner and Larson 1978; Westbury 1978	yes	early Caddoan	dates and diagnostic artifacts show that the predominant component in this part of the site is early Caddoan	flexed; head to S; on back
	Feature 162A	Doehner and Larson 1978	yes	early Caddoan	dates and diagnostic artifacts show that the predominant component in this part of the site is early Caddoan	unknown
41HP105	Burial 1	Hyatt and Doehner 1975; Westbury 1975, 1978	yes	early Caddoan or Woodland	the site has strong early Caddoan and Woodland components, but they have not been separated; burial could date to either period	flexed; no other details given

Table 15, continued

Site	Burial	Reference	Reanalyzed by Geo-Marine	Age	Rationale for Age Assessment	Burial Pattern
41HP105, cont'd.	Burial 2	Hyatt and Doehner 1975; Westbury 1975, 1978	no	early Caddoan or Woodland	the site has strong early Caddoan and Woodland components, but they have not been separated; burial could date to either period	unknown
	Burial 3	Hyatt and Doehner 1975; Westbury 1975, 1978	yes	early Caddoan or Woodland	the site has strong early Caddoan and Woodland components, but they have not been separated; burial could date to either period	flexed; head to W; side unknown
41HP106	Burial 1 (Feature 1)	Perttula 1990; Gill-King 1990	yes	early Caddoan	reportedly associated with midden 2, which has been dated to the early Caddoan period	multiple individuals; 1 extended with head to NE
	Burial 2 (Feature 2)	Perttula 1990; Gill-King 1990	yes	early Caddoan	near and perhaps associated with midden 2, which has been dated to the early Caddoan period; early Caddoan date from the fill	extended; head to SW
	Burial 3 (Feature 3)	Perttula 1990; Gill-King 1990	yes	early-middle Caddoan	reportedly associated with Structure B, which has been dated to the early-middle Caddoan period	extended; head to SW
	Burial 4 (Feature 35)	Perttula 1990; Gill-King 1990	no	early Caddoan	reportedly associated with midden 2, which has been dated to the early Caddoan period	multiple individuals; at least 1 extended with head to ESE
	Burial 5 (Feature 36)	Perttula 1990; Gill-King 1990	no	early-middle Caddoan	reportedly associated with Structure B, which has been dated to the early-middle Caddoan period	extended; head to NE
	Burial 6 (Feature 7)	Perttula 1990; Gill-King 1990	no	early Caddoan	reportedly predates Structure B, which has been dated to the early-middle Caddoan period	unknown
	Burial 7 (Feature 25)	Perttula 1990	yes	probably Woodland	reportedly associated with the primary North Rise midden, which has been assessed as Woodland based on the artifacts	cremation; multiple individuals

Table 15, continued

Site	Burial	Reference	Reanalyzed by Geo-Marine	Age	Rationale for Age Assessment	Burial Pattern
41HP106, cont'd.	Burial 8 (Feature 55)	Perttula 1990	yes	probably Woodland	assessed as Woodland based on the fact that it is a cremation and proximity to primary North Rise midden	cremation; multiple individuals
	Burial 9 (Feature 60)	Perttula 1990	yes	probably Woodland	assessed as Woodland based on the fact that it is a cremation and the content of the Southwest Rise artifact collection	cremation
	Burial 10 (Feature 63)	Perttula 1990	yes	probably Woodland	assessed as Woodland based on the fact that it is a cremation and the content of the Southwest Rise artifact collection	cremation
	Burial 11 (Feature 64)	Perttula 1990	yes	probably Woodland	assessed as Woodland based on the fact that it is a cremation and the content of the Southwest Rise artifact collection; fill yielded late Archaic date, but this may not date actual interment	cremation; multiple individuals
	Burial 12 (Feature 65)	Perttula 1990	yes	probably Woodland	assessed as Woodland based on the fact that it is a cremation and the content of the Southwest Rise artifact collection	cremation; multiple individuals
	Burial 13 (Feature 68)	Perttula 1990; Gill-King 1990	no	early-middle Caddoan	assessed as early-middle Caddoan based on the fact that it is extended and predominance of materials of this age on the South and North Rises	extended; head to NE
	Burial 14 (Feature 73)	Perttula 1990; Gill-King 1990	no	probably Woodland	assessed as Woodland based on the fact that it is a possible bundle burial and the content of the Southwest Rise artifact collection	possible bundle burial
	Burial 15 (Feature 77)	Perttula 1990; Gill-King 1990	no	probably Woodland	assessed as Woodland based on the fact that it is a possible bundle burial and the content of the Southwest Rise artifact collection	possible bundle burial
	Burial 16 (Feature 81)	Perttula 1990	yes	probably Woodland	assessed as Woodland based on the fact that it is a possible bundle burial or cremation and the content of the Southwest Rise artifact collection	possible bundle burial or cremation

Table 15, continued

Site	Burial	Reference	Reanalyzed by Geo-Marine	Age	Rationale for Age Assessment	Burial Pattern
41HP106, cont'd.	Burial 17 (Feature 90)	Perttula 1990	yes	probably Woodland	assessed as Woodland based on the fact that it is a cremation and the content of the Southwest Rise artifact collection	cremation
	Burial 19 (Feature 18)	Perttula 1990	no	probably Woodland	assessed as Woodland based on the fact that it is a cremation and the content of the Southwest Rise artifact collection	cremation
	Burial 20 (Feature 59)	Perttula 1990; Gill-King 1990	no	probably Woodland	assessed as Woodland based on the fact that it is a possible bundle burial and the content of the Southwest Rise artifact collection	possible bundle burial
	Burial 21 (Feature 66)	Perttula 1990	no	probably Woodland	assessed as Woodland based on the fact that it is a possible bundle burial and the content of the Southwest Rise artifact collection	possible bundle burial
	Burial 22 (Feature 69)	Perttula 1990	no	probably Woodland	assessed as Woodland based on the fact that it is a possible bundle burial and the content of the Southwest Rise artifact collection	possible bundle burial

outside the Gulf Coastal Plain. Unfortunately, estimating the size of the living population based upon inventory data can be equivocal since several factors other than population size—for example, the number of sites examined, the types of sites examined, and the extent of excavation—can influence the number of burials recovered. One line of evidence, however, that may document the proposed greater population of the sites in the Cooper Lake area is a comparison of the distribution of the numbers of burials per site at Cooper Lake compared to prehistoric hunters and gatherers in central, south, and Trans-Pecos Texas. Steele and Olive (1989) report that, for the 271 sites with recovered or recorded burials from these areas, 127 sites had 1 individual reported, 99 had 2 to 9 individuals reported or recovered, 45 sites had 10 or more individuals recovered, and 3 sites had 100 or more. Based upon these data, 1 in 27 sites had 10 or more individuals recovered, while at Cooper Lake 2 of the 9 sites reported had 10 or more individuals. This suggests that the Cooper Lake area may have had a population density greater than southern Texas. On the other hand, Story et al. (1990) suggest that the population density among the Caddoans was greater east of Cooper Lake than in the Blackland Prairie around Cooper Lake. Again, this assumption is supported by the greater number of sites with more than 10 burials found east of Cooper Lake than are found in the Cooper Lake area.

Burnett (1990) raises a different issue that could have affected the population size for Cooper Lake. She found that her sample of burials from Cooper Lake (based on Westbury's [1975, 1978] original analysis of 22 individuals from 41DT1, 41DT6, 41DT80, 41HP102, and 41HP105; 20 of these were included in the Geo-Marine reanalysis) had more dental caries than individuals in more-eastern Caddoan populations, and she attributed this to a greater dietary reliance on carbohydrates and less animal protein. This reduced quality of diet not only could have affected the health of the population but also could have negatively affected how many individuals the region could support. While the similar mean numbers of burials recovered per site at Cooper Lake compared to the entire Caddoan population of the Gulf Coastal Plain does not support Burnett's thesis, it is likely that the mean burial per site statistic is simply not sensitive enough to corroborate or deny her thesis.

TAPHONOMY

Taphonomic analyses of human skeletal remains recovered from sites have only recently been addressed in a systematic fashion (Steele 1989; Steele and Olive 1989). The issues most commonly raised when evaluating the taphonomic processes affecting human remains deal with documenting the extent of postmortem degradation and loss of skeletal remains; understanding the processes of destruction and dispersal of bones; and assessing the role of humans as agents causing the modification, destruction, and dispersal of human skeletal remains at archeological sites.

Most authors reporting on the state of preservation of the human skeletal remains at Cooper Lake note their incomplete and fragmentary nature (Burnett and Harmon 1989:C-4; Derrick and Steele 1993:273; Gill-King 1990:235; Johnson 1962:240; Westbury 1975:67–68, 1978:160; Wilson and Steele 1996:2). Westbury (1978:160) is more explicit, stating that "in certain cases post depositional disturbances of human burials recovered from 41DT1, 41DT6, 41DT80, 41HP102, and 41HP105 were so extreme that original burial positions were obliterated."

The analysis presented here provides a more objective assessment of the state of preservation. Table 16 provides a summary of the elements recovered from sites 41DT6, 41DT80, 41DT124, 41HP78, 41HP102, 41HP105, and 41HP106 and whether they were complete or incomplete. The table shows that most of the burials have bones missing and that most of the bones present are incomplete. An examination specifically of the skull reveals that bones of the face (e.g., the maxilla, palatine, and zygomatic) are typically missing or incomplete, while the bones of the braincase (e.g., the frontal, parietals, occipital, and temporals) more commonly tend to be present and complete. This pattern of preservation of the skull typically is seen in skeletons recovered from interments in the soil, for the bones of the braincase have a thicker cortical component than the thin bones of the face. One anomaly in the data set concerns the mandible, which is recorded as being consistently absent while the mandibular condyle, a portion of the mandible, is recorded as consistently recovered. This incongruence probably is a coding error. The site where the most-complete burials were recovered is 41HP102.

TABLE 16

SUMMARY OF SKELETAL ELEMENTS RECOVERED*

	41DT6			41DT80					41DT124		41HP78	41HP102															41HP105		41HP106		
Burial No.	1	2	3	1	2	3	4	6	1	2	3	1	2a	2b	3	4	5	6	7	8	9	10	11	12	13	F.162A	1	3	1	2	3
Frontal		s	c	c	s	s	s	c	s	s	s	c	s		c	c	c	s		s	s	s	s	c	s	s	c	c	s		s
Parietal		c	c	c	c	s	s	c	s	c	s	c	s	s	c	c	c	c		s		c	s	s	s		c	c	s		s
Occipital		c	s	c	s	s	c	c	s	c	s	c	s	s	c	c	c	s			s	c	c	s	s	s	c	c	s		s
Temporal		s	c	c	s	s	s	s	s	s	s	s	s	s	c	c	c	s					s	s	c		c	c	s		s
TMJ		c	c	c	s		s	s		c	s	c	s	s	c	c	c	s					c	s	c		c	c	s		c
Zygomatic		s		s							c	s	s		s	c	c	s		s	c		s	c	c		s	s	s		
Maxilla		s		c		s		c		s		s	s		s	c	s	s		s	c		c	s	c		c	s			
Palatine						c	s	c		s		s											s		s		s				
Mandible									s																						
Condyle					s	s	c	c		c	s	c	s			c		c		s	c		c	s	c		s	s	s		
Hyoid															c																
Hyoid body													c					c						s	s		c				
Clavicle	s	c	c	c		c				s	s	s	s		c	s	c	s		s	s	s	c	s	s	s	s	s			
Scapula	s	s	s	s	s	s	s			s		s	s	s	s	s	c	s		s	s		s	c	s	s	s		s		
Glenoid	s	s	c	c		s	s			s		s	c	s	c	c	s	s		s			c	c	c	s			s		
Manubrium			s			c						c	c				c				c		c	s	s						
Sternum Body			s	s						s	s	c	c		s	s	c				c		s	s	s						
Xiphoid																															
C1		c		c		c		s	s	s		c			c	c	c	s			c	s		s	s	s	s	s			

*Cremated remains are not included; c = complete; s = incomplete.

Table 16, continued

	41DT6			41DT80					41DT124		41HP78	41HP102															41HP105		41HP106		
Burial No.	1	2	3	1	2	3	4	6	1	2	3	1	2a	2b	3	4	5	6	7	8	9	10	11	12	13	F.162A	1	3	1	2	3
C2		c		c		c				s		c	s		c		c	c			c	s		s	c		s	s			
C3–C6				s		s		s		s		s	s		s	s	s	s		s	s	s		s	s	s	s	s			
C7				c		c						c			c		c			c	c			c	c						
T1–T9	s	s		s		s	s	s		s	s	s	s	s	s	s	s	s		s	s	s	s	s	s	s	s				
T10		c		s		s		s			c	c			s		c	s		s	s		c	c	s						
T11	c	c		c				s			c	c			c		c	c		s	s			c	c						
T12	s	c		c			c	s			c	c	c		c	s	c	s		c	c			s	s		s				
L1	s	c		c		s		s			s	c	s		s	s	c	s		s	s			c	s		s				
L2	c	c		c		s	c	s			s	c	s		s		c	s		s	c			c	c		s				
L3	s	c		c	c	s	c	s			s	c	s		c	c	c	c		s	c			c	c		s				
L4		s		c		s	s	s			c	c	c		c		c	s		s	c			c	c		s				
L5				c		c	s				c		s				c	c		s				s			s				
Sacrum	s	s		s	s	c		s		s	s	c	s		s	s	c	s		s			s	s	s		s		s		
Rib1	s	s	s	s		s	s			s	s	s	s		c	s	s	s		s	s		s	s	s						
Rib2		s	s	s								s			s		s	s		s			s		s						
Rib3–10	s	s	s	s	s	s	s	s		s	s	s	s		s	s	s	s	s	s	s		s	s	s						
Rib11		s	c	s								s			s	s	s	s			s		s	s						
Rib12		s	c								c	s	s				s				s				s						
Ilium	s	s	s	c		s	s	c		s	s	c	s	s	c	s	c	s		s	c		c	s	c		s			s	
Ischium			s					s			s	s			s		s	s		s	s		c	s	s						
Pubis	s	s	c	s		c		c		c	c	c	s		c	c	c	c		c	c		c	s	c		s	s	s		

Table 16, continued

	41DT6			41DT80					41DT124		41HP78	41HP102															41HP105		41HP106		
Burial No.	1	2	3	1	2	3	4	6	1	2	3	1	2a	2b	3	4	5	6	7	8	9	10	11	12	13	F.162A	1	3	1	2	3
Acetabulum	s	s	c	s		c	s	c		s	s	c	s		c	s	c	s		s	c		c	s	s		s	s	s	s	
Auricular Surface	s	s	c	c		c	s	c		s	s	c	s		c	c	c	c		s	c		c	c	c		c			s	
Humerus	s	c	c	c	s	c	s	s		s	s	c	s	s	s	s	s	s	s	s	c	s	s	c	s	s	s	s	s	s	s
Radius	s	s	c	s		s	s	s		s	s	c	s		s	s	c	s		s	s		s	s	s	s	s	s	s		s
Ulna	s	s	c	s	s	s	s	s	s	c	s	c	s	s	s	s	s	s	s	s	c		s	s	s		s	s	s		s
Femur		c	c	c	s	c	s	s	s	s	c	c	s		s	s	c	s	s	c	c	s	c	s	s		s	s	s	s	s
Tibia	s	c	c	c	s	s	s	s	s	s	c	c	s		s	s	s	c	s	s	s	s	c	s	s		s		s	s	s
Fibula	s	s	s	s		s	s	s		s	s	s	s			s	s	s	s	s	s		s	s	s		s		s	s	
Patella	s	s	c			s	s			c	s	s	s			s	c	s	s	s	c				c		s		s		s
Ccarpals	s	s	s			s	s			s	s	s		s	s		s	s		s	s		s	s	s		s				
Metacarpals	s		c	s		s				s	s	s		s	s	s	s	s		s	c		s		s		s				s
Phalanges (hand)		s	s			s	s	s		s	s	s	s		s	s	s	s		s	s		s	s	s		s				s
Talus		c	c	c		c	s	c		s	c	c	s			s	c	c		c			s	c	s		s		s		
Calcaneus	s	c	c	c		s	s	c		c	c	c	s				s	c		s			c	c	s		s		s		
Tarsals	s	s	s	s			s			s	s	s	s	s	s	s	s			s			s	s	s			s			
Metatarsals	s		s			s	s			s	s	s	s	s	s	s		s		s	s		s	s	s						
Phalanges (foot)	s		s			s	s	s		s		s	s	s				s			s		s	s						s	

In an attempt to more effectively evaluate the degree of destruction of the skeletal remains, the data provided on the coding forms for the examined sites were used to estimate the relative completeness of each skeleton (Table 17). Estimates of completeness for each of the bones recorded were 0, 33, and 66 percent complete. Small bones of the wrists, hands, and feet were recorded as absent or complete. Cremated individuals recovered from sites 41HP78 and 41HP106 are not included since they are listed only as cremations on the coding forms. Estimates of skeleton completeness range from less than 1 to 81 percent. The mean state of completeness for all skeletons is 33.1 percent; however, there is notable variation among the sites. Site 41HP106 had the least well preserved remains, averaging 10 percent completeness per skeleton. The sites with the highest mean for completeness are 41DT6 (45.3 percent) and 41HP102 (43.7 percent).

The completeness of the long bones of the arm and leg was also examined (Table 18). These bones have the thickest cortex of the bones of the human skeleton and generally decay more slowly in buried environments. This assumption is substantiated for the Cooper Lake assemblage since the average completeness of these bones (Table 19) is higher than the average state of completeness for the entire skeleton as described above. These data also document that the remains from 41HP106 are the least well preserved.

The taphonomic processes affecting human remains at Cooper Lake were not specifically considered by most of the initial researchers. Gill-King (1990:235) provides one of the few assessments of postmortem taphonomic processes acting upon human burials in the region based on the remains from 41HP106. He attributes the dry and brittle condition of the bones, and their low organic

TABLE 17

PERCENT COMPLETENESS OF BURIALS*

Site (Mean % Completeness)	Burial/Feature Number	Percentage Complete	Site (Mean % Completeness)	Burial/Feature Number	Percentage Complete
41DT6 (45.3)	1	22	41HP102 (43.7)	1	81
	2	49		2a	45
	3	65		2b	6
				3	47
				4	41
				5	65
				6	62
				7	9
41DT80 (33.1)	1	58		8	48
	2	10		9	60
	3	50		10	13
	4	39		11	52
	5a**	19		12	54
	5b**	9		13	63
	6	47		F.162a	9
41DT124 (32.5)	1**	8	41HP105 (24.5)	1	39
	2	57		3	10
41HP78 (11.8)	1**	<1	41HP106 (10.0)	1	14
	3	55		2	5
	4**	<1		3	11
	5**	<1			
	6**	<1			

*Cremations are not included.

**Computed as means based on Burnett and Harmon's (1989) data.

TABLE 18

PERCENT COMPLETENESS OF THE LONG BONES OF THE ARM AND LEG*

Site	Burial/Feature No.	Humerus	Radius	Ulna	Femur	Tibia	Fibula
41DT6	1	87	47	37	0	3	20
	2	100	87	90	100	100	80
	3	100	100	100	100	100	80
41DT80	1	100	57	93	100	100	77
	2	20	0	30	50	40	0
	3	100	67	37	100	87	10
	4	70	97	57	97	90	53
	5a**	31	31	31	87	62.5	87
	5b**	0	0	0	0	0	0
	6	97	73	97	80	27	73
41DT124	1**	0	0	19	7.5	19	0
	2	73	90	100	90	67	80
41HP78	1**	3	3	3	19	3	3
	3	67	87	87	100	100	63
	4**	20	0	0	1.5	3	1.5
	5**	0	1.5	0	0	1.5	0
	6**	0	0	0	0	0	0
41HP102	1	100	100	100	100	100	97
	2a	73	100	87	40	33	77
	2b	17	0	7	0	0	0
	3	50	40	50	63	77	0
	4	60	47	57	80	57	57
	5	87	100	87	100	90	90
	6	50	47	43	93	100	87
	7	30	0	17	57	67	53
	8	50	73	70	100	97	73
	9	100	77	100	100	63	67
	10	50	0	0	77	40	0
	11	73	67	50	100	100	37
	12	100	73	90	90	57	80
	13	97	93	77	93	83	63
	F.162a	77	50	0	0	0	0
41HP105	1	97	83	87	73	73	60
	3	30	23	3	17	0	0
41HP106	1	63	40	47	67	13	30
	2	10	0	0	57	33	7
	3	20	33	13	30	13	0

*Cremations are not included.

**Computed as means based on Burnett and Harmon's (1989) data.

TABLE 19

MEAN PERCENT COMPLETENESS OF SKELETONS PER SITE*

Site	Humerus	Radius	Ulna	Femur	Tibia	Fibula
41DT6	95.7	78	75.7	66.7	67.7	60
41DT80	77.4	58.8	62.8	85.4	68.8	42.6
41DT124	73	90	100	90	67	80
41HP78	67	87	87	100	100	63
41HP102	67.6	51.1	55.7	72.9	64.3	52.1
41HP105	63.5	53	45	45	36.5	30
41HP106	31	24.3	20	51.3	19.7	12.3

content, to recurring wetting and drying, root damage, and the humic conditions of the soil. Derrick and Steele (1993:273), in examining remains from 41DT6 and 41DT16, state that the most commonly observed evidence of the causes of bone destruction at these sites are rodent gnaw marks and root etchings. They further note the presence of "a black spidery residue" on several elements and propose that the material is a plant residue. No data were recorded during the Geo-Marine reanalysis that would permit an assessment of the processual issues of taphonomy.

DEMOGRAPHY

Sex and age of the prehistoric individuals from Cooper Lake were assessed using a variety of techniques. The individuals analyzed by Westbury (1978) were age assessed on the basis of one or more of the following: dental eruption (Bass 1971:13–14; Brothwell 1965:58–59; Kronfield 1954:3–34), dental attrition (Brothwell 1965:67–70), epiphyseal union (Bass 1971:14–18; Brothwell 1965:60–63; Krogman 1962), endocranial suture closure, and length of the femur for subadults (Krogman 1962:170). She determined sex using one or more of the following: pelvic observations (Anderson 1962:142–143; Bass 1971:157–162; Brothwell 1965:54–55; Krogman 1962:138–141), cranial observations (Anderson 1962:141; Brothwell 1965:51–52; Krogman 1962:115–116), discriminant function (Giles 1961:129–135; Giles and Elliot 1965:53–67), and size of long bones (Brothwell 1965:56–57; Pearson 1917–1919:56). Gill-King (1990) utilized robusticity to determine sex (Stewart 1979:85–96) and one or more of the following techniques to determine age: dental development and/or attrition, cranial suture closure (Krogman 1962:80–82), and cortical development and decline. The techniques used by other authors are summarized in Steele and Bramblett (1988) and Buikstra and Ubelaker (1994).

Table 20 provides a summary of age and sex data for the Cooper Lake remains. The average age of death for both samples (reviewed and examined) is 29.7 years, which is higher than the average age of death reported for Cooper Lake sites 41DT1, 41DT6, 41DT80, 41HP102, and 41HP105 by Burnett (1990:400). Burnett's (1990:400) reported range of life expectancy is 20.0 to 28.3 years. The best-represented site she includes from Cooper Lake is Arnold (41HP102) for which she presents a mean age of death of 24.8 years compared with the mean presented here of 31.9 years. The greater mean ages of death reported here likely reflect the increase in the sample primarily by adult individuals and the refinement of age categories in the remains reanalyzed by Geo-Marine.

Based upon the total Cooper Lake sample for which sex could be determined, adult males had a significantly higher average age at death of 46.6 years compared to adult females who had an average age at death of 38.4 years. Since the sex of subadults could not be assessed, these are the average ages at death only of those individuals who reached maturity. The relatively high ages of adults at death indicate that, if an individual lived to maturity, the individual then had a good chance of having a relatively long adult life. This is further emphasized by the fact that several individuals recovered from Cooper Lake are identified as being older than 50 years (listed in Table 20 as 50+ years). Unfortunately, the maximum age at death is difficult to assess by standard observational means. Old adults

TABLE 20

AGE AND SEX ASSESSMENTS

Site	Burial/ Feature No.	Age	Basis for Age Assessment	Sex	Basis for Sex Assessment
41DT1	B. 4	17	unknown	female	unknown
	B. 1 (SMU)	20+	unknown	unknown	lack of diagnostics
41DT6	B. 1	40–50	partial auricular surface	male	robusticity
	B. 2	40–44	auricular surface; ectocranial sutures; palatine sutures	male	pelvic and cranial morphology
	B. 3	40–44	pubic symphysis; auricular surface; ecto- and endocranial sutures	male	pelvic and cranial morphology
	F. 1	20–24	auricular surface	female	pelvic and cranial morphology
41DT16	F. 6a	20–29	pubic symphysis and auricular surface	female	width of sciatic notch; diameter of acetabulum and humeral head; pelvic morphology
	F. 6b	newborn–2 weeks	humerus and tibia length	unknown	age
	F. 7a	3–5	long bone length; dental eruption and formation	unknown	age
	F. 7b	juvenile, possible infant	lack of diagnostics	unknown	age
41DT80	B. 1	40–49	auricular surface	female	pelvic and cranial morphology
	B. 2	2–7	unknown	unknown	age
	B. 3	15–20	epiphyseal closure; dental eruption	unknown	age
	B. 4	50+	auricular surface	female	pelvic and cranial morphology
	B. 5a	6–10	long bone length, epiphyseal closure; dental development	unknown	age
	B. 5b	3–5	dental development	unknown	age
	B. 6	5–10	dental eruption	unknown	age
41DT124	B. 1	50+	loss of teeth; cranial sutures	male	cranial and femoral morphology
	B. 2	20–35	epiphyseal closure; dental eruption and wear	female	pelvic and cranial morphology

Table 20, continued

Site	Burial/ Feature No.	Age	Basis for Age Assessment	Sex	Basis for Sex Assessment
41HP78	B. 1	12–15	dental eruption and development	unknown	age
	B. 3	40–44	auricular surface	female	pelvic and cranial morphology
	B. 4	unknown	lack of diagnostics	unknown	lack of diagnostics
	B. 5	5–10	dental eruption and development	unknown	age
	B. 6	unknown	lack of diagnostics	unknown	lack of diagnostics
41HP102	B. 1	20–35	auricular surface; palate suture	male	pelvic and cranial morphology
	B. 2a	50+	palate sutures; degenerative joint disease; dental wear	male	pelvic and cranial morphology
	B. 2b	10–15	epiphyseal closure	unknown	age
	B. 3	50+	pubic symphysis; auricular surface; ecto- and endocranial sutures	male	pelvic and cranial morphology
	B. 4	4–7	epiphyseal closure; dental characteristics	unknown	age
	B. 5	50+	pubic symphysis; auricular surface	male	pelvic and cranial morphology
	B. 6	35–50	auricular surface	male	pelvic and cranial morphology
	B. 7	10–15	epiphyseal closure	unknown	age
	B. 8	40–44	pubic symphysis; auricular surface	male	pelvic and cranial morphology
	B. 9	50–59	pubic symphysis; auricular surface	female	pelvic and cranial morphology
	B. 10	birth to 0.5 years	epiphyseal closure	unknown	age
	B. 11	40–44	pubic symphysis; auricular surface; ecto- and endocranial sutures; palate sutures	male	pelvic and cranial morphology
	B. 12	33–37	auricular surface; palate sutures	female	pelvic and cranial morphology
	B. 13	50–59	pubic symphysis; auricular surface	female	pelvic and cranial morphology
	F. 162a	birth to 0.5 years	long bone measurements	unknown	age

Table 20, continued

Site	Burial/ Feature No.	Age	Basis	Sex	Basis
41HP105	B. 1	50+	auricular surface; ecto- and endocranial sutures; palate sutures	male	pelvic and cranial morphology
	B. 2	unknown	lack of diagnostics	unknown	lack of diagnostics
	B. 3	50+	dental wear; degenerative joint disease	female	cranial morphology
41HP106	B. 1	adult	lack of diagnostics	male	cranial morphology
	B. 2	adult	lack of diagnostics	unknown	lack of diagnostics
	B. 3	adult	lack of diagnostics	unknown	lack of diagnostics
	B. 4a	subadult	unknown	unknown	age
	B. 4b	subadult	unknown	unknown	age
	B. 5	senescent	unknown	male	unknown
	B. 6	mid-adult	unknown	female	unknown
	B. 13	senescent	unknown	male	unknown
	B. 14	mid-adult	unknown	female	unknown
	B. 15a	senescent	unknown	female	unknown
	B. 15b	subadult	unknown	unknown	age
	B. 20	subadult	unknown	unknown	age

are listed on the coding forms for the reanalyzed remains only as 50+ years, and none of the other authors working with Cooper Lake remains assessed age of death for old adults as greater than 50 years. The higher mean age of death for males is typical of human populations, and this is usually assumed to be a reflection of a higher mortality rate of adolescent and young adult females due to complications during pregnancy and childbirth.

The adult sex ratio of the total sample from Cooper Lake, exclusive of the 18 subadults, 7 adults, and 3 individuals of unknown age for whom sex could not be determined, is 14 females to 16 males. Table 21 provides comparable data for prehistoric Caddoans from neighboring regions in the Gulf Coastal Plain based on information provided by Burnett (1990). While the sex ratio for the combined samples from the Gulf Coastal Plain closely approximates 1:1 (174 females to 175 males), there is variation in the ratios between the locales. Three locales (Red River, Middle Sabine River, and Wylie focus), as well as Cooper Lake, have slightly higher ratios of males to females, while four locales (Little River, Sulphur River, Upper Sabine River, and Neches River) have greater numbers of females. It is interesting to note that, while Cooper Lake has more males than females, the rest of the Sulphur River drainage has a greater number of females. Several factors could have caused these differences in sex ratios: (1) sampling errors due to small sample sizes; (2) biases toward one sex or the other in the techniques of sexing adult skeletons; (3) higher mortality rates in adolescent and young adult females; or (4) higher mortality among adult males, usually attributed to aggressive encounters. Unfortunately, no conclusions as to which of these are the

TABLE 21

SEX RATIOS FOR COOPER LAKE AND PREHISTORIC CADDOAN SAMPLES FROM THE GULF COASTAL PLAIN*

Sample	No. of Females	% Females	No. of Males	% Males
Cooper Lake	14	46.6	16	53.3
Little River	12	80	3	20
Red River	106	48.6	112	51.4
Sulphur River	10	66.7	5	33.3
Upper Sabine River	12	57.1	9	42.9
Middle Sabine River	5	31.2	11	68.8
Neches River	3	75	1	25
Wylie Focus	12	40	18	60
Totals:	174	49.9	175	50.1

*Data for locales other than Cooper Lake are derived from Tables 87, 91, 96, 99, 104, 109, and 113 of Burnett (1990); Sulphur River data exclude Cooper Lake.

probable causes affecting the higher ratio of males to females in the Cooper Lake assemblage can be reached.

BODY SIZE AND SEXUAL DIMORPHISM

Tables 22–25 provide the means and standard deviations for all measurements recorded during the Geo-Marine reanalysis of the skeletal and dental remains from Cooper Lake. The relatively poor state of preservation is clearly reflected in the paucity of measurements that could be taken.

The femur and the tibia, the two long bones that provide the most accurate estimates of stature (Steele and Bramblett 1988), are used to assess body height. Because of the small sample sizes and the nonsignificant differences in bone length between sites (see Table 24), all of the Cooper Lake specimens were combined. Table 26 provides the mean stature estimates based upon these mean lengths. The regression formulae used to compute stature are those of Genovese (1967) which are based upon Mesoamerican samples. These formulae were chosen because they are based upon samples that most closely approximate the Cooper Lake population.

The male stature estimates based upon the femur and tibia are the same, and the female stature estimates based upon these two bones differ by 6.6 cm. Because of the greater difference in the two female stature estimates and the smaller sample size, it is less certain that the assessment of the stature of the female population inhabiting the Cooper Lake area is accurate. Both the male and the female stature estimates compare favorably with estimates made of a prehistoric Caddoan assemblage from northeast Texas reported by Doran (1975) who reports males to be 169.0 cm and females to be 158.0 cm. They also compare favorably with estimates of males (168.7 cm) and females (162.0 cm) recovered from the central Texas site of Loeve-Fox, a habitation site of a prehistoric hunting and gathering population (Butler 1982). Doran (1975) and Steele and Powell (n.d), however, both note that these populations were among the tallest in the Texas region, taller than those of the west Texas region or the Tamaulipan biotic province in southern Texas.

Three measurements were chosen to assess the extent of sexual dimorphism: (1) maximum femur length; (2) maximum diameter of the femur head; and (3) femur circumference taken at midshaft. Femur length was chosen rather than stature to measure sexual dimorphism of body height since the stature estimates are based on the femur. Femur head diameter and circumference of the femur at midshaft were chosen to estimate sexual dimorphism of body mass because the femur directly bears the body weight. Table 27 documents these measurements and the male to female ratio for the combined assemblage from Cooper Lake. As above, the samples were combined because of the small individual site samples and the lack of significant differences in these measurements among sites.

TABLE 22

MEAN CRANIAL MEASUREMENTS*

Measure	41DT6	41DT80	41DT124	41HP102	41HP105	41HP106
Cranial length		♀ 175 (1)		♂ 186 ± 4.3 (3)	♀ 168 (1) ♂ 170 (1)	
Cranial breadth		♀ 129 (1)		♂ 136 ± 5.6 (3)	♀ 131 (1)	
Basion-bregma height				♂ 141 (1)		
Cranial base length				♂ 108 (1)		
Maxillo-alveolar breadth				♂ 60 (1)		
Bizygomatic diameter				♂ 91 (1)		
Biauricular breadth					♀ 116 (1) ♂ 121 (1)	
Upper facial height					♂ 15 (1)	
Minimum frontal breadth		♀ 85 (1)		♂ 87 ± 2.0 (2)	♀ 88 (1) ♂ 85 (1)	
Upper facial breadth		♀ 100 (1)		♂ 111 ± 1.0 (2)		
Nasal height					♂ 71 (1)	
Nasal breadth					♂ 24 (1)	
Orbital breadth		♀ 31 (1)		♂ 40 (1)	♀ 36 (1)	
Orbital height				♂ 37 (1)		
Biorbital breadth		♀ 93 (1)			♀ 101 (1)	
Interorbital breadth				♂ 25 (1)	♀ 23 (1) ♂ 18 (1)	

*Sample sizes are in parentheses.

Table 22, continued

Measure	41DT6	41DT80	41DT124	41HP102	41HP105	41HP106
Frontal chord		♀ 108 (1)		♂ 113.2 ± 4.3 (4)	♀ 104 (1) ♂ 111 (1)	
Parietal chord	♂ 108 (1)	♀ 112 (1)		♀ 101 (1) ♂ 108 ± 8.1 (5)	♀ 109 (1) ♂ 107 (1)	
Occipital chord	♂ 107 (1)	♀ 96 (1)		♀ 97 (1) ♂ 108 (1)	♂ 96 (1)	
Mastoid length				♂ 28 (1)	♂ 31 (1)	♂ 21 (1)
Chin height		♀ 34.5 (1)		♀ 30 ± 5.0 (2) ♂ 34.3 ± 2.0 (3)	♀ 32 (1)	
Mandibular body height				♀ 28 (1) ♂ 32.2 ± 1.7 (5)	♀ 34 (1) ♂ 34 (1)	♂ 30 (1)
Mandibular body breadth				♀ 10 ± 1.0 (2) ♂ 11.8 ± 0.4 (4)	♀ 1 ♀ 101 (1)	♂ 12 (1)
Bigonial width				♀ 95.5 ± 4.5 (2) ♂ 106.3 ± 5.2 (3)		
Bicondylar breadth			♀ 112 (1)			
Minimum ramus breadth		♀ 32 (1)		♀ 35.5 ± 3.5 (2) ♂ 35.2 ± 1.3 (4)	♂ 31 (1)	♂ 37 (1)
Maximum ramus breadth		♀ 44 (1)		♀ 43 ± 1.0 (2) ♂ 42.3 ± 2.0 (3)	♂ 41 (1)	♂ 51 (1)
Maximum ramus height		♀ 53 (1)	♀ 56 (1)	♀ 54 ± 4.0 (2) ♂ 59 ± 3.5 (3)		
Mandibular length		♀ 84 (1)	♀ 104 (1)	♀ 80 (1) ♂ 88 ± 7.0 (2)		
Mandibular angle				♀ 119 (1) ♂ 121 (1)		

TABLE 23

MEAN MEASUREMENTS OF THE SHOULDER, OS COXA, SACRUM, AND FEET*

Measure	41DT6	41DT80	41DT124	41HP78	41HP102	41HP105
Clavicle						
Anterior-posterior diameter, midshaft	♂ 11.9 (1)	♀ 10 (1)		♀ 11 (1)	♂ 11 ± 0 (2)	
Vertical diameter, midshaft	♂ 10.7 (1)	♀ 8 (1)		♀ 7 (1)	♂ 9 ± 0 (2)	
Maximum length	♂ 150.4 ± 0.6 (2)	♀ 132 (1)			♂ 147 ± 0 (2)	
Os coxa						
Height					♀ 197 ± 0 (2) ♂ 213 ± 0 (2)	
Pubis length					♀ 85 (1) ♂ 89 (1)	
Ishium length		♀ 182 (1)			♀ 92 (1) ♂ 85.7 ± 5.5 (2)	
Iliac breadth					♀ 144 ± 2.0 (2) ♂ 148 ± 6.0 (2)	
Sacrum						
Anterior length		♀ 96 (1)			♂ 107 ± 1.3 (2)	
Superior breadth					♂ 114 ± 2.0 (2)	
Maximum transverse diameter of base		♀ 40 (1)			♂ 49 (1)	
Calcaneus						
Maximum length	♂ 75 (1)	♀ 71 (1)	♀ 75.3 (1)	♀ 76 (1)	♀ 75.5 ± 0.5 (2) ♂ 81 ± 5.9 (5)	♂ 80 (1)
Middle breadth	♂ 44 (1)	♀ 39 (1)		♀ 47 (1)	♂ 43.4 ± 3.6 (5)	

*Sample sizes are in parentheses.

TABLE 24

MEAN MEASUREMENTS OF THE LONG BONES*

Measure	41DT6	41DT80	41DT124	41HP78	41HP102	41HP105	41HP106
Humerus							
Vertical diameter of head	♂ 47 ± 2.0 (2)	♀ 37 (1)			♀ 39.7 ± 1.2 (2) ♂ 45 ± 1.3 (5)	♂ 49 (1)	
Maximum diameter, midshaft	♂ 23 ± 1.0 (2)	♀ 19 (1)			♀ 19.3 (3) ♂ 21.2 ± 1.6 (5)	♂ 23 (1)	
Minimum diameter, midshaft	♂ 17 ± 1.0 (2)	♀ 14 (1)			♀ 14.7 ± 0.5 ♂ 15.6 ± 1.0 (5)	♂ 17 (1)	
Maximum length	♂ 340.3 ± 7.4 (3)	♀ 298 (1)			♀ 321 ± 2.6 (3) ♂ 326 ± 11.0 (4)	♂ 337 (1)	
Epicondylar breadth	♂ 62.5 ± 1.5 (2)	♀ 48 (1)		♀ 57 (1)	♀ 52.5 ± 3.5 (2) ♂ 61.8 ± 2.3 (7)		♂ 61 (1)
Radius							
Anterior-posterior diameter, midshaft		♀ 10 (1)		♀ 10 (1)	♀ 10.7 ± 0.5 (3) ♂ 11.4 ± 1.1 (6)		
Transverse diameter, midshaft		♀ 11 (1)		♀ 14 (1)	♀ 13 ± 1.4 (3) ♂ 13.7 ± 0.9 (6)		
Maximum length	♂ 265 ± 5.0 (2)	♀ 225 (1)		♀ 230 (1)	♀ 246.7 ± 4.1 (3) ♂ 261.8 ± 21.7 (6)		
Ulna							
Anterior-posterior diameter, midshaft	♂ 15.3 ± 1.9 (3)	♀ 10 (1)		♀ 11 (1)	♀ 11.5 ± 1.5 (2) ♂ 14.8 ± 1.3 (6)	♂ 17 (1)	♂ 14 (1)
Transverse diameter, midshaft	♂ 15.3 ± 0.9 (3)	♀ 15 (1)		♀ 17 (1)	♀ 13 ± 1.0 (2) ♂ 14.3 ± 1.9 (6)	♂ 12 (1)	♂ 18 (1)

*Sample sizes are in parentheses.

Table 24, continued

Measure	41DT6	41DT80	41DT124	41HP78	41HP102	41HP105	41HP106
Maximum length	♂ 270 ± 17.8 (3)				♀ 260.5 ± 5.5 (2) ♂ 285.7 ± 31.6 (3)		
Physiological length				♀ 221 (1)	♀ 235.5 ± 5.5 (2) ♂ 250.6 ± 25.5 (5)	♂ 254 (1)	
Minimum circumference	♂ 4.3 ± 0.7 (2)	♀ 45 (1)		♀ 38 (1)	♀ 30 ± 2.0 (2) ♂ 34 ± 3.0 (5)		
Fibula							
Maximum diameter, midshaft		♀ 15 (1)			♂ 18.5 ± 1.3 (2)		
Maximum length		♀ 334 (1)			♂ 363.5 ± 16.5 (2)		
Femur							
Maximum length	♂ 470.5 ± 7.5 (2)	♀ 436 (1)		♀ 427 (1)	♀ 450 ± 8.0 (2) ♂ 467 ± 32.5 (4)	♂ 451 (1)	
Bicondylar length	♂ 468± 8.0 (2)	♀ 431 (1)		♀ 423 (1)	♀ 444.5 ± 8.5 (2) ♂ 464.5 ± 32.3 (4)	♂ 449 (1)	
Epicondylar breadth	♂ 81 ± 2.0 (2)	♀ 71 (1)			♀ 70.5 ± 2.5 (2) ♂ 79 ± 0 (2)		
Maximum diameter of head	♂ 48.5 ± 0.5 (2)	♀ 39 ± 0 (2)	♀ 49 (1)	♀ 41 (1)	♀ 40 ± 0 (2) ♂ 45.6 ± 3.1 (5)	♂ 45 (1)	
Sagittal subtrochanteric diameter	♂ 32.5 ± 0.5 (2)	♀ 22.5 ± 0 (2)		♀ 21 (1)	♀ 26.3 ± 3.4 (3) ♂ 28.8 ± 3.9 (5)	♂ 27 (1)	♀ 29 (1) ♂ 26 (1)
Transverse subtrochanteric diameter	♂ 29 ± 1.0 (2)	♀ 28 ± 1.0 (2)		♀ 31 (1)	♀ 27.3 ± 3.1 (3) ♂ 27.8 ± 2.3 (5)	♂ 36 (1)	♀ 30 (1) ♂ 34 (1)
Sagittal midshaft diameter	♂ 33 ± 2.0 (2)	♀ 27 (1)		♀ 25 (1)	♀ 30.5 ± 0.5 (2) ♂ 30 ± 2.2 (4)	♂ 29 (1)	

Table 24, continued

Measure	41DT6	41DT80	41DT124	41HP78	41HP102	41HP105	41HP106
Transverse midshaft diameter	♂ 25.5 ± 0.5 (2)	♀ 22 (1)		♀ 25 (1)	♀ 24.5 ± 0.5 (2) ♂ 25.8 ± 4.9 (4)	♂ 26 (1)	
Midshaft circumference	♂ 95.5 ± 4.5 (2)	♀ 89 (1)		♀ 78 (1)	♀ 85.5 ± 3.3 (2) ♂ 90.5 ± 3.5 (4)	♂ 90 (1)	
Tibia							
Maximum diameter, nutrient foramen	♂ 43 (1)	♀ 31 ± 1.0 (2)		♀ 31 (1)	♀ 34 ± 1.0 (2) ♂ 37.3 ± 1.1 (6)	♂ 37.5 (1)	
Transverse midshaft diameter	♂ 29 (1)	♀ 19.5 ± 1.5 (2)		♀ 19 (1)	♀ 21 ± 1.0 (2) ♂ 24.2 ± 1.1 (6)	♂ 23 (1)	
Length	♂ 395 ± 10 (2)	♀ 340 ± 0 (2)		♀ 357 (1)	♂ 399 ± 32.0 (4)		
Proximal epiphyseal breadth	♂ 83 (1)	♀ 69 (1)			♂ 74 ± 2.1 (4)		
Distal epiphyseal breadth	♂ 54 (1)	♀ 43 (1)		♀ 47 (1)	♂ 46.8 ± 3.0 (4)		
Circumference at nutrient foramen		♀ 86.5 ± 8.5 (2)		♀ 78 (1)	♀ 87 ± 2.0 (2) ♂ 100.7 ± 4.4 (6)	♂ 96 (1)	

TABLE 25

MEASUREMENTS OF TEETH FROM SEXED ADULTS*

Tooth	41DT124	41HP102	41DT124	41HP78	41HP102
	Right Maxillary		Left Maxillary		
M3					
mesio-distal		♂ 9.02	♀ 9.9		♂ 8.05
bucco-lingual		♂ 11.82	♀ 10.2		♂ 11.19
crown height		♂ 6.34	♀ 5.2		♂ 6.91
M2					
mesio-distal		♂ 9.45 ♀ 10.3	♀ 9.7		♂ 9.81
bucco-lingual		♂ 12.13 ♀ 9.9	♀ 10.8		♂ 11.87
crown height		♂ 7.38 ♀ 3.75	♀ 6.3		♂ 5.82
M1					
mesio-distal		♂ 10.6	♀ 10.3		♂ 10.49
bucco-lingual		♂ 12.52	♀ 11.3		♂ 11.88
crown height		♂ 5.96	♀ 5.8		♂ 4.6
P2					
mesio-distal		♂ 7.12	♀ 7.2		♂ 6.48
bucco-lingual		♂ 10.1	♀ 9.45		♂ 9.56
crown height		♂ 2.13	♀ 7.25		♂ 6.28
P1					
mesio-distal		♂ 7.27 ♀ 7.11	♀ 7.45		
bucco-lingual		♂ 10.68 ♀ 9.48	♀ 10.05		
crown height		♂ 7.5 ♀ 4.22	♀ 7.45		
C					
mesio-distal		♂ 8.46	♀ 8.45		
bucco-lingual		♂ 8.57	♀ 9.25		
crown height		♂ 8.98	♀ 8.85		♂ 10.14
I2					
mesio-distal		♂ 6.7	♀ 7.8		
bucco-lingual		♂ 5.74	♀ 7.3		♂ 6.58
crown height		♂ 7.35	♀ 9.2		♂ 5.8
I1					
mesio-distal		♂ 8.55	♀ 8.55		♂ 8.75
bucco-lingual		♂ 6.92	♀ 7.85		♂ 6.93
crown height		♂ 8.56	♀ 9.4		♂ 6.99
	Right Mandibular		Left Mandibular		
M3					
mesio-distal	♀ 9.8	♂ 10.26			♂ 10.17
bucco-lingual	♀ 10.95	♂ 10.19			♂ 9.93
crown height	♀ 5.6	♂ 5.8			♂ 4.19

*Measurements were taken at the occlusal surface in planes indicated.

Table 25, continued

Tooth	41DT124	41HP102	41DT124	41HP78	41HP102
M2					
mesio-distal	♀ 11.05	♂ 11.16			♂ 11.77
bucco-lingual	♀ 10.55	♂ 10.72			♂ 10.8
crown height	♀ 5.3	♂ 7.0			♂ 5.03
M1					
mesio-distal	♀ 11.25	♂ 11.49			♂ 11.55
bucco-lingual	♀ 11.3	♂ 11.1			♂ 10.78
crown height	♀ 3.8	♂ 6.47			♂ 4.15
P2					
mesio-distal	♀ 7.3	♂ 7.33			♂ 8.36
bucco-lingual	♀ 8.65	♂ 7.58			♂ 8.54
crown height	♀ 5.45	♂ 7.09			♂ 5.74
P1					
mesio-distal	♀ 7.3	♂ 7.16		♀ 6.68	
bucco-lingual	♀ 8.65	♂ 8.17		♀ 7.19	
crown height	♀ 6.0	♂ 7.82		♀ 4.8	
C					
mesio-distal		♂ 7.19			♀ 6.5
bucco-lingual		♂ 7.75			♀ 7.58
crown height		♂ 9.72			♀ 7.07
I2					
mesio-distal	♀ 6.0	♂ 6.23			
bucco-lingual	♀ 6.6	♂ 5.82			♂ 6.19
crown height	♀ 7.2	♂ 6.87			♂ 7.55
I1					
mesio-distal	♀ 5.3	♂ 4.45			
bucco-lingual	♀ 6.0	♂ 5.48			
crown height	♀ 7.3	♂ 6.75			

TABLE 26

MEAN LENGTHS OF THE FEMUR AND TIBIA AND RESULTING STATURE ESTIMATES*

	Male		Female	
	Mean Length	Stature	Mean Length	Stature
Femur	46.97 + 0.80 (7)	172.5 + 3.4	44.26 + 0.78 (4)	164.3 + 3.8
Tibia	40.15 + 0.90 (3)	172.5 + 2.8	34.57 + 0.10 (3)	157.7 + 3.5

*Sample sizes are in parentheses; measurements are in centimeters.

TABLE 27

FEMUR MEASUREMENTS AS INDICATORS OF SEXUAL DIMORPHISM*

Femur Measurement	Male	Female	Male/Female Ratio
Mean length	469.7 (7)	442.6 (5)	106.1
Head diameter	45.4 (8)	39.8 (5)	114.0
Midshaft circumference	93.0 (7)	85.3 (4)	109.0

*Sample sizes are in parentheses; measurements are in millimeters.

Stini (1985) states that the range of male/female body size ratios for humans is between 104 and 111. Comparing these figures to those determined for Cooper Lake indicates that the Cooper Lake assemblage is near the upper limit of sexual dimorphism for humans based on the two measures of robusticity and near the lower limit for stature. A male/female ratio of 106 is obtained for Doran's (1975) Caddoan sample from northeast Texas based on stature, and a slightly smaller ratio of 104 is obtained for the Loeve-Fox assemblage based on stature as well.

While stature and robusticity are known to be under genetic control to some degree, it is also known that stature and body size are strongly influenced by the quantity and quality of diet as well as the health of the individual. One widely held model proposes that body size in women will vary less because populations try to optimize the available resources for women to assure reproductive success, while male body weights may fall below optimum in lean times and rise above optimal body size in times of food surplus. Unfortunately, the data presented here are not robust enough to effectively determine if body size in females is less in the Cooper Lake assemblage, or if the males are greater than the average.

POPULATION AFFINITIES

The issue of the population affinities of the Cooper Lake area is an interesting and important research topic, but because of the paucity of the recovered remains examined here and the limitations of the scope of the investigation, this is an issue that will have to be addressed in the future. However, it is worth raising the issue at this time and providing the information that is available.

The point has been made that the prehistoric and protohistoric populations that inhabited the region of the northeastern edge of the Blackland Prairie of Texas south of the Red River and along the western portions of the Sulphur River drainage lived in a different biotic environment than the Caddoans to the east and north of them. Burnett (1990:418) states that "The cultural affiliations of both the prehistoric Cooper Lake and Wylie focus inhabitants of the Blackland Prairie are undefined, and it is not known how they relate temporally or culturally to the Caddoan peoples to the east." Burnett goes on to state (Story et al. 1990:432):

> The bioarchaeological synthesis of the eastern portion of the study area indicates that the Wylie focus and prehistoric Cooper Lake inhabitants shared a similar biocultural adaptation, which is distinctive from the rest of the study area. In comparison, these prairie edge inhabitants experienced a markedly diminished adaptive efficiency, much higher frequencies of skeletal infection, endured more intensive labor activities, and consumed a diet richer in carbohydrates than elsewhere in the eastern portion of the Gulf Coastal Plain.

A corollary question needs to be raised: If the population within this region is adaptively and culturally distinct, is it genetically distinct as well? In other words, were these people a westward extension of the Caddoan population occupying a prairie environment marginally suitable for the Caddoan way of life? Or, were these people of the Cooper Lake region and the Wylie focus a population genetically distinct from the Caddoan peoples, but a population that had acquired some of the cultural and economic practices of the Caddoans to the east? To effectively address this issue, or at

least raise the level of questioning to a higher plane, will require a detailed multivariate analysis of the remains compared with Caddoan assemblages to the east and hunting and gathering populations to the west and south. At this point, we can only raise the issue and make available the metric (see Tables 22–25) and nonmetric (Tables 28 and 29) data on the skeletal and dental remains recovered from Cooper Lake.

DIET

The diet any particular population follows is a reflection of both cultural and natural environments. A maize-intensive diet is one aspect of Caddoan diets not seen among their hunter-gatherer predecessors. To assess diet, most bioarcheological studies focus on dental remains and/or stable isotope analysis of bone. This section reviews the dental evidence of diet presented in previously published studies from Cooper Lake as well as those examined by Geo-Marine and reported on here. The stable isotope data presented by Gill-King (1990) also are reviewed.

Cariogenesis, dental attrition, antemortem tooth loss, and abscessing primarily reflect diet and food processing strategies. Reliance on maize provides a sticky carbohydrate-rich dietary source favorable to cariogenic microbial attack in the oral environment. This, in turn, can provide an entry point for infectious agents to the rest of the body.

Throughout the Americas, increased reliance on maize has been correlated with increased dental disorders, and the Caddo are no exception. For example, Rose et al. (1984), Powell (1985), and Burnett (1990) found much lower caries rates among the Fourche Maline population which had a greater reliance on hunting and gathering than among later Caddoan populations. Stable isotope results generally agree with the interpretation of these results (Gill-King 1990; Tiné and Tieszen 1994; Wilson and Cargill 1993).

Because dental disorders are age cumulative, it is important to review the age of this sample prior to comparisons among sites (Table 30). Since average age of death varies significantly when children are included, only adult dental data are compared. Although there appears to be a large variance, there is no statistically significant difference among the sites examined here in average adult age of death. The lack of difference among sites is likely due to small sample sizes.

Dental attrition is not considered a disorder but the natural result of occlussal abrasion and a diet containing unprocessed vegetal materials and grit. Grit is introduced into the diet in a variety of ways, including through the use of stone grinding implements. Depending on the environment, sand particles unintentionally ingested can also result in a considerable amount of attrition. Dental attrition can lead to disorders if the pulp cavity is exposed. If exposed, the pulp cavity can serve as the focus of infection, resulting in abscessing and eventual tooth loss.

Wear was estimated using both the Smith (1984) and Scott (1979) techniques in the reanalysis by Geo-Marine and in the analysis of some of the material from 41DT1 by Wilson and Steele (1996). Derrick and Steele (1993) used Smith's (1984) technique for their analysis from 41DT16. Burnett and Harmon (1989) present means of attrition scores by tooth type using Scott's (1979) technique for their analysis of 41DT80 AND 41HP78. Westbury (1978) used less-standard techniques which are likely not directly comparable to either Smith's (1984) or Scott's (1979) method. Gill-King's (1990) data are strictly descriptive and are not repeated here.

Since dental wear is typically age progressive, only adults are considered. Adults are defined roughly as those individuals 20 years and over, assuring eruption of the third molar. Table 31 presents the average wear for all individuals analyzed using the Smith (1984) and/or Scott (1979) procedures. Interobserver error should be considered an additional source of error in wear estimates since as many as six individuals recorded the scores presented below.

Since Scott's (1979) method is a more detailed measure of wear, it was used to test for differences in wear patterns between the sexes. Wear scores were averaged and individuals were grouped into age categories of 10-year intervals. When individuals could not be placed into these categories, they were omitted. Although female attrition was slightly higher than male attrition, a two-tailed student's *t* test found no statistically significant differences between the female and male populations.

A chi-square test indicates that significant differences (at the .05 level) in mean dental wear per site exist, but these are also related to average adult age of death (see Table 31; Table 32). Dental wear is age progressive in this sample from Cooper

TABLE 28

FREQUENCIES OF NONMETRIC SKELETAL TRAITS

	41DT6	41DT16	41DT80	41DT124	41HP78	41HP102	41HP105	41HP106
METOPIC SUTURE								
absent	B. 3		B. 1 B. 4 B. 6	B. 1* B. 2		B. 1 B. 2a B. 3 B. 4 B. 5 B. 6 B. 10 B. 11 B. 12 B. 13	B. 1 B. 3	B. 3
SUPRAORBITAL STRUCTURES								
Supraorbital Notch								
absent			B. 6 (r)			B. 4 (l&r) B. 11 (l) B. 12 (l)	B. 1 (l) B. 2 (r)	
< ½ occluded by spicules	B. 3 (r) F. 1 (l&r)*	F. 6a (l&r)*	B. 1 (l&r) B. 6 (l)	B. 1 (r)* B. 2 (r)		B. 1 (l&r) B. 3 (r) B. 5 (l) B. 6 (l) B. 11 (r) B. 13 (l&r)	B. 1 (r) B. 2 (l)	B. 1 (r) B. 3 (l)
> ½ occluded by spicules						B. 3 (l) B. 5 (r) B. 6 (r)		

Note: Sides on which the trait was observable are in parentheses following burial designation: (l) left; (r) right.

*Data collected by Derrick and Steele (1993) were recorded as absent, partial, or complete and thus are not fully compatible with the format used here; data collected by Burnett and Harmon (1989) were recorded as absent or present.

Table 28, continued

	41DT6	41DT16	41DT80	41DT124	41HP78	41HP102	41HP105	41HP106
present, degree of occlusion unknown					B. 3 (r)			
Foramen								
absent	B. 3 (r)		B. 1 (l&r) B. 6 (l)	B. 1 (l&r)* B. 2 (l&r)	B. 3 (r)	B. 1 (l&r) B. 3 (r) B. 5 (r) B. 6 (l&r) B. 11 (r) B. 13 (l&r)	B. 1 (r) B. 2 (r)	B. 3 (l)
present			B. 6 (r)			B. 4 (r) B. 5 (l) B. 9 (l) B. 11 (l)	B. 1 (l) B. 2 (l)	
multiple foramina						B. 2a (l) B. 12 (l)		
INFRAORBITAL SUTURE								
absent			B. 1 (l&r)			B. 11 (r)	B. 1 (l)	
complete			B. 6 (l&r)			B. 4 (l&r) B. 5 (r) B. 13 (l&r)		
MULTIPLE INFRAORBITAL FORAMINA								
absent			B. 1 (r) B. 6 (l&r)			B. 3 (l) B. 5 (r) B. 11 (r) B. 13 (l&r)	B. 1 (l)	
internal division only			B. 1 (l)			B. 4 (r)		
two distinct foramina						B. 4 (r)		

Table 28, continued

	41DT6	41DT16	41DT80	41DT124	41HP78	41HP102	41HP105	41HP106
ZYGOMATIC-FACIAL FORAMEN								
absent			B. 6 (l)			B. 3 (l) B. 13 (l)		
1 large			B. 6 (r)		B. 3 (l)	B. 5 (r) B. 6 (l) B. 9 (l) B. 12 (l&r) B. 13 (r)	B. 1 (l)	
1 large plus smaller foramen	B. 2 (l)					B. 1 (r) B. 4 (l) B. 5 (l)		
2 large					B. 3 (r)			
2 large plus smaller foramen						B. 4 (r) B. 9 (r)		
1 small			B. 1 (r) B. 3 (l)					
multiple small			B. 3 (r)			B. 11 (r)	B. 2 (r)	B. 1 (r)
PARIETAL FORAMEN								
absent	B. 2 (l&r) F. 1 (r)		B. 1 (r) B. 2 (r)		B. 3 (l)	B. 5 (l&r) B. 6 (l&r) B. 10 (l) B. 12 (l&r) B. 13 (l)	B. 1 (l&r) B. 2 (r)	B. 3 (l)
present, on parietal	B. 3 (l&r)	F. 6a (r)*	B. 1 (l) B. 2 (l) B. 3 (l&r) B. 4 (l)			B. 11 (l&r)	B. 2 (l)	
present, sutural								

Table 28, continued

	41DT6	41DT16	41DT80	41DT124	41HP78	41HP102	41HP105	41HP106
SUTURAL BONES								
Epiteric Bone								
absent	B. 3 (l&r)					B. 1 (l&r) B. 5 (l&r) B. 6 (l) B. 11 (r) B. 12 (l&r)	B. 1 (l&r) B. 2 (l&r)	
present			B. 1 (l)					
Coronal Ossicle								
absent	B. 3 (l&r)		B. 1 (l&r) B. 2 (l&r)			B. 1 (l&r) B. 3 (l&r) B. 5 (l&r) B. 6 (l&r) B. 11 (r) B. 12 (l&r)	B. 1 (l&r) B. 2 (r)	
Bregmatic Bone								
absent	B. 3		B. 1 B. 2	B. 1*	B. 3	B. 1 B. 3 B. 5 B. 6 B. 11 B. 12 B. 13	B. 1 B. 2	
Sagittal Ossicle								
absent	B. 2 B. 3		B. 2		B. 3	B. 1 B. 3 B. 5 B. 6 B. 11 B. 13	B. 1 B. 2	
present			B. 1					

Table 28, continued

	41DT6	41DT16	41DT80	41DT124	41HP78	41HP102	41HP105	41HP106
Apical Bone								
absent			B. 1 B. 2		B. 3	B. 1 B. 3 B. 4 B. 5 B. 12 B. 13	B. 1 B. 2	B. 3 (l)
present	B. 3					B. 6 B. 11		
Lambdoid Ossicle								
absent	B. 3 (l)	F. 6a				B. 1 (l) B. 5 (l&r)		B. 3 (l)
present	F. 1		B. 1 (l&r)			B. 3 (r) B. 6 (l&r) B. 11 (r)	B. 2 (l)	
Asterionic Bone								
absent	B. 3 (l)	F. 6a (l&r)	B. 1 (l) B. 2 (l&r)			B. 3 (l&r) B. 4 (l) B. 5 (l&r) B. 11 (r) B. 13 (r)	B. 1 (l&r) B. 2 (r)	
present	F. 1 (l&r)					B. 1 (r)	B. 2 (l)	B. 1 (r)
Ossicle in Occipito-Mastoid Suture								
absent	B. 3 (l)		B. 1 (l) B. 2 (l)			B. 3 (l&r) B. 5 (l&r) B. 11 (r) B. 13 (l&r)	B. 1 (l&r)	B. 1 (r)
present								

Table 28, continued

	41DT6	41DT16	41DT80	41DT124	41HP78	41HP102	41HP105	41HP106
Parietal Notch Bone								
absent	B. 3 (l)		B. 1 (l)			B. 3 (l&r) B. 4 (l) B. 5 (r) B. 11 (r) B. 12 (l&r) B. 13 (l&r)	B. 1 (l&r) B. 2 (l&r)	
present						B. 2b (r) B. 5 (l)		
INCA BONE								
absent	B. 2 B. 3		B. 1 B. 2 B. 4		B. 3	B. 1 B. 3 B. 4 B. 5 B. 6 B. 11 B. 12 B. 13	B. 1 B. 2	B. 3
CONDYLAR CANAL								
not patent						B. 11 (r)		
patent			B. 1 (r) B. 2 (l) B. 3 (l)			B. 2a (l&r) B. 3 (r) B. 5 (l&r) B. 13 (r)		
DIVIDED HYPOGLOSSAL CANAL								
absent	B. 2 (r)		B. 1 (r) B. 3 (r) B. 6 (l&r)	B. 2 (l&r)	B. 3 (r)	B. 2a (l&r) B. 4 (l&r) B. 5 (l) B. 8 (l) B. 9 (l&r) B. 11 (l&r) B. 12 (l&r) B. 13 (r)	B. 2 (l)	

Table 28, continued

	41DT6	41DT16	41DT80	41DT124	41HP78	41HP102	41HP105	41HP106
partial, internal surface			B. 3 (l)			B. 3 (r)		
complete, internal surface			B. 4 (l)			B. 3 (l) B. 5 (r)	B. 1 (l&r)	
complete, within canal							B. 2 (r)	
FLEXURE OF SUPERIOR SAGITTAL SULCUS								
right	B. 2 (r)		B. 1 (r) B. 2 (l) B. 3 (r) B. 4 (r) B. 6 (l)	B. 1*		B. 1 (r) B. 2a (r) B. 3 (r) B. 4 (r) B. 5 (r) B. 6 (r) B. 9 (r) B. 11 (r) B. 12 (r) B. 13 (r)	B. 1 (r) B. 2 (r)	B. 1 (r) B. 3 (r)
left	B. 2 (l)		B. 4 (l) B. 6 (r)		B. 3 (l)	B. 4 (l) B. 5 (l) B. 6 (l) B. 10 (l) B. 11 (l) B. 13 (l)		B. 1 (l)
bifurcate			B. 1 (l) B. 2 (r)			B. 1 (l) B. 3 (l)	B. 1 (l) B. 2 (l)	B. 3 (l)
FORAMEN OVALE INCOMPLETE								
absent	B. 3 (l)		B. 1 (l&r)			B. 2a (l) B. 5 (l&r) B. 9 (l&r) B. 11 (l&r) B. 12 (l) B. 13 (l)	B. 1 (r) B. 2 (r)	

Table 28, continued

	41DT6	41DT16	41DT80	41DT124	41HP78	41HP102	41HP105	41HP106
FORAMEN SPINOSUM INCOMPLETE								
absent	B. 3 (l)		B. 1 (l&r)			B. 2a (l) B. 5 (l&r) B. 9 (l) B. 12 (l) B. 13 (l)	B. 1 (r)	
PTERYGO-SPINOUS BRIDGE								
absent	B. 3 (l)			B. 1*		B. 12 (l)		
trace						B. 2a (l) B. 5 (l&r) B. 11 (l) B. 13 (l)		
partial			B. 1 (l)			B. 9 (l)		
PTERYGO-ALAR BRIDGE								
absent			B. 1 (l&r)			B. 5 (l&r) B. 9 (l) B. 11 (l&r) B. 12 (l) B. 13 (l)		
trace	B. 3 (l)					B. 2a (l)		
TYMPANIC DEHISCENCE								
absent	B. 2 (l&r) B. 3 (l&r)		B. 1 (l&r) B. 2 (l) B. 3 (l&r) B. 4 (l) B. 6 (l&r)	B. 2 (l&r)		B. 1 (l&r) B. 2a (l&r) B. 3 (l&r) B. 4 (l&r) B. 5 (l&r) B. 6 (l) B. 11 (l&r) B. 12 (l) B. 13 (l&r)	B. 1 (l&r) B. 2 (l&r)	B. 3 (l&r)

Table 28, continued

	41DT6	41DT16	41DT80	41DT124	41HP78	41HP102	41HP105	41HP106
AUDITORY EXOSTOSIS								
absent	B. 2 (l&r) B. 3 (l&r)		B. 1 (l&r) B. 2 (l) B. 3 (l&r) B. 4 (l)	B. 2 (l&r)		B. 2a (l) B. 3 (l&r) B. 4 (l&r) B. 5 (l&r) B. 6 (l) B. 12 (l) B. 13 (l&r)	B. 1 (l&r) B. 2 (r)	B. 1 (r) B. 3 (l)
< ⅓ canal occluded						B. 1 (l&r)		
MASTOID FORAMINA								
Location								
absent	B. 2 (l&r)		B. 1 (l&r)			B. 4 (l) B. 11 (r) B. 12 (l) B. 13 (l&r)	B. 1 (l&r)	
temporal	B. 3 (l)		B. 2 (l)	B. 2 (l&r)		B. 2a (l) B. 3 (l&r) B. 4 (r) B. 5 (l&r) B. 11 (l) B. 12 (r)	B. 2 (l)	B. 1 (r)
sutural	B. 3 (r)							
both sutural and temporal					B. 3 (l)	B. 6 (l)		
Number								
absent	B. 2 (l&r)	F. 6a (l&r)	B. 1 (l&r)	B. 2 (l&r)		B. 4 (l) B. 11 (r) B. 12 (l) B. 13 (l&r)	B. 1 (l&r)	

Table 28, continued

	41DT6	41DT16	41DT80	41DT124	41HP78	41HP102	41HP105	41HP106
1	B. 3 (l&r)		B. 2 (l) B. 6 (l&r)			B. 4 (r) B. 5 (l) B. 6 (l) B. 11 (l) B. 12 (r)	B. 2 (l)	B. 1 (r)
2	F. 1 (r)				B. 3 (l)	B. 2a (l) B. 3 (l&r)		
more than 2	F. 1 (l)					B. 5 (r)		
MENTAL FORAMEN								
absent			B. 6 (l&r)	B. 2 (l&r)				
1		F. 6a (l&r)*	B. 2 (l) B. 3 (l&r) B. 4 (l&r)		B. 3 (l&r)	B. 1 (l&r) B. 2a (l&r) B. 4 (l&r) B. 5 (l&r) B. 6 (l&r) B. 9 (l&r) B. 11 (l&r) B. 12 (l) B. 13 (l&r)	B. 1 (r) B. 2 (l&r)	B. 1 (r)
MANDIBULAR TORUS								
absent			B. 2 (l) B. 3 (l&r) B. 4 (l&r) B. 6 (l)	B. 1 (r)* B. 2 (l&r)	B. 3 (l&r)	B. 1 (l&r) B. 2a (l&r) B. 4 (l) B. 5 (l&r) B. 6 (l&r) B. 9 (l&r) B. 11 (l) B. 12 (l&r)	B. 1 (r) B. 2 (l&r)	B. 1 (r)
trace						B. 11 (r)		

Table 28, continued

	41DT6	41DT16	41DT80	41DT124	41HP78	41HP102	41HP105	41HP106
MYLOHYOID BRIDGE								
Location								
absent			B. 2 (l) B. 3 (r) B. 4 (l&r) B. 6 (l)			B. 1 (l&r) B. 2a (r) B. 4 (l&r) B. 5 (l&r) B. 6 (l&r) B. 9 (l&r) B. 11 (r) B. 12 (l&r) B. 13 (l&r)	B. 1 (r) B. 2 (r)	
center of groove						B. 11 (l)		
Degree								
absent			B. 2 (l) B. 3 (r) B. 4 (l&r) B. 6 (l)			B. 1 (l&r) B. 2a (r) B. 4 (l&r) B. 5 (l&r) B. 6 (l&r) B. 9 (l&r) B. 11 (r) B. 12 (l&r) B. 13 (l&r)	B. 1 (r) B. 2 (r)	
complete						B. 11 (l)		
ATLAS BRIDGING								
Lateral Bridging								
absent	B. 2 (l&R)		B. 1 (l&r) B. 3 (l&r)			B. 3 (r) B. 4 (l&r) B. 6 (l&r) B. 9 (l)		
partial						B. 13 (r)		

Table 28, continued

	41DT6	41DT16	41DT80	41DT124	41HP78	41HP102	41HP105	41HP106
complete						B. 5 (r) B. 9 (r) B. 13 (l)		
Posterior Bridging								
absent	B. 2 (l&r)		B. 3 (l&r)			B. 3 (r) B. 4 (l&r) B. 5 (l&r) B. 6 (l&r) B. 9 (l&r) B. 13 (l&r)		
complete			B. 1 (l&r)					
ACCESSORY TRANSVERSE FORAMEN								
absent			B. 3 (r)			B. 5 (l&r) B. 8 (l) B. 9 (r)		
partial						B. 1 (r) B. 12 (l)		
complete						B. 12 (r)		
SEPTAL APERTURE								
absent	B. 1 (l) B. 2 (l&r) F. 1 (l)		B. 1 (l&r) B. 2 (r) B. 4 (l&r)			B. 1 (l&r) B. 3 (l) B. 4 (l&r) B. 5 (r) B. 8 (l) B. 9 (r) B. 10 (r) B. 13 (l&r)		
small foramen				B. 2 (r)		B. 11 (r) B. 12 (l)	B. 2 (r)	
true perforation	B. 3 (l&r)	F. 6a (r)*	B. 3 (l&r)		B. 3 (l&r)	B. 2a (l&r) B. 2b (r) B. 6 (l) B. 12 (r)		

TABLE 29

NONMETRIC DENTAL TRAITS

	41DT80	41DT124	41HP78	41HP102	41HP106
RIGHT MAXILLARY					
M3					
hypocone (0–6)	B. 3: 4 B. 6: 4	B. 2: 3		B. 1: 0 B. 6: 0 B. 11: 0 B. 13: 0	
metaconule (0–5)	B. 3: 0 B. 6: 0	B. 2: 0	B. 1: 0*	B. 1: 0 B. 6: 0 B. 11: 0 B. 13: 0	
Carabelli's trait (0–7)	B. 3: 0 B. 6: 0	B. 2: 0		B. 1: 0 B. 6: 0 B. 11: 0 B. 13: 0	
enamel extensions (0–3)	B. 3: 0 B. 6: 0	B. 2: 1		B. 1: 1 B. 6: 0 B. 11: 0 B. 13: 0	
M2					
hypocone (0–6)	B. 3: 4 B. 6: 4	B. 2: 0		B. 1: 0 B. 6: 3 B. 11: 0	
metaconule (0–5)	B. 3: 0 B. 5a: 0* B. 5b: 0* B. 6: 0	B. 2: 0	B. 1: 0*	B. 1: 0 B. 6: 0 B. 11: 0	
Carabelli's trait (0–7)	B. 3: 0 B. 6: 0	B. 2: 0		B. 1: 0 B. 6: 0 B. 11: 0	
enamel extensions (0–3)	B. 3: 0 B. 6: 0	B. 2: 1		B. 1: 1 B. 6: 2 B. 11: 0	

Note: Number following the burial designation indicates feature expression score following Turner et al. (1991). Number in parentheses following dental feature name is the range of scores possible for the feature. Scores recorded as 0 from the data collected by Geo-Marine, Inc., may be either trait missing or unobservable due to a problem in recording procedure. When teeth were recorded as missing, they were omitted from the table.

*From Burnett and Harmon's (1989) list of dental traits. Note that Geo-Marine and Burnett and Harmon (1989) recorded dissimilar traits.

Table 29, continued

	41DT80	41DT124	41HP78	41HP102	41HP106
M1					
hypocone (0–6)	B. 3: 4 B. 6: 5	B. 2: 0		B. 1: 4 B. 4: 4	
metaconule (0–5)	B. 3: 0 B. 5a: 0* B. 5b: 1* B. 6: 0	B. 2: 0	B. 1: 0*	B. 1: 0 B. 4: 1	
Carabelli's trait (0–7)	B. 3: 0 B. 6: 0	B. 2: 0		B. 1: 0 B. 4: 1	
enamel extensions (0–3)	B. 3: 0 B. 6: 0	B. 2: 1		B. 1: 0 B. 4: 3	
P1					
premolar root number (1–3)	B. 3: 2 B. 4: 0 B. 6: 1	B. 2: 1		B. 1: 0 B. 11: 0 B. 13: 1	
I2					
shoveling (0–7)	B. 3: 5 B. 5a: 4* B. 5b: 5*	B. 2: 1	B.1: 4*	B. 1: 1 B. 11: 0 B. 13: 0	
double-shoveling (0–6)	B. 3: 0 B. 5a: 1* B. 5b: 1*	B. 2: 4	B. 1: 2*	B. 1: 0 B. 11: 0 B. 13: 0	
peg-shaped incisor (0–2)	B. 3: 0	B. 2: 0		B. 1: 0 B. 11: 0 B. 13: 0	
I1					
winging (0–4)	B. 3: 0	B. 2: 0		B. 1: 3 B. 13: 3	
shoveling (0–7)	B. 3: 3 B. 5a: 2* B. 5b: 3*	B. 2: 3	B.1: 5*	B. 1: 2 B. 13: 0	
double-shoveling (0–6)	B. 3: 2 B. 5a: 1* B. 5b: 1*	B. 2: 4	B. 1: 2*	B. 1: 1 B. 13: 0	

Table 29, continued

	41DT80	41DT124	41HP78	41HP102	41HP106
LEFT MAXILLARY					
I1					
winging (0–4)	B. 3: 0	B. 2: 0		B. 1: 3 B. 4: 0 B. 6: 0 B. 13: 3	
shoveling (0–7)	B. 3: 0 B. 5a: 2* B. 5b: 3*	B. 2: 3	B. 1: 5*	B. 1: 2 B. 4: 0 B. 6: 2 B. 13: 0	
double-shoveling (0–6)	B. 3: 0 B. 5a: 1* B. 5b: 1*	B. 2: 4	B. 1: 2*	B. 1: 1 B. 4: 0 B. 6: 3 B. 13: 0	
I2					
shoveling (0–7)	B. 3: 5 B. 4: 0 B. 5b: 5*	B. 2: 1	B. 1: 4*	B. 1: 1 B. 6: 2 B. 11: 0 B. 13: 0	
double-shoveling (0–6)	B. 3: 1 B. 4: 0 B. 5b: 1*	B. 2: 4	B. 1: 2*	B. 1: 0 B. 6: 1 B. 11: 0 B. 13: 0	
peg-shaped incisor (0–2)	B. 3: 0 B. 4: 0	B. 2: 0		B. 1: 0 B. 6: 0 B. 11: 0 B. 13: 0	
P1					
premolar root number (1–3)	B. 3: 2 B. 4: 0 B. 6: 1	B. 2: 1		B. 1: 0 B. 6: 0 B. 11: 0	B. 3: 0
M1					
hypocone (0–6)	B. 3: 4 B. 6: 5	B. 2: 0		B. 1: 4 B. 4: 3.5 B. 6: 0 B. 11: 0 B. 13: 0	B. 3: 0
metaconule (0–5)	B. 3: 0 B. 5a: 0* B. 5b: 1* B. 6: 0	B. 2: 0	B. 1: 0*	B. 1: 0 B. 4: 0 B. 6: 0 B. 11: 0 B. 13: 0	B. 3: 0

Table 29, continued

	41DT80	41DT124	41HP78	41HP102	41HP106
Carabelli's trait (0–7)	B. 3: 0 B. 6: 0	B. 2: 0		B. 1: 0 B. 4: 2 B. 6: 0 B. 11: 0 B. 13: 0	B. 3: 0
enamel extensions (0–3)	B. 3: 1 B. 6: 0	B. 2: 1		B. 1: 0 B. 4: 3 B. 6: 0 B. 11: 0 B. 13: 0	B. 3: 1
M2					
hypocone (0–6)	B. 3: 4 B. 6: 4	B. 2: 0		B. 1: 2 B. 6: 3 B. 11: 0 B. 13: 0	
metaconule (0–5)	B. 3: 0 B. 5a: 0* B. 5b: 0* B. 6: 0	B. 2: 0	B. 1: 0*	B. 1: 0 B. 6: 0 B. 11: 0 B. 13: 0	
Carabelli's trait (0–7)	B. 3: 0 B. 6: 0	B. 2: 0		B. 1: 0 B. 6: 0 B. 11: 0 B. 13: 0	
enamel extensions (0–3)	B. 3: 1 B. 6: 0	B. 2: 1		B. 1: 0 B. 6: 2 B. 11: 0 B. 13: 0	
M3					
hypocone (0–6)	B. 3: 3.5 B. 6: 3	B. 2: 3		B. 1: 0 B. 6: 0 B. 11: 0	
metaconule (0–5)	B. 3: 0 B. 6: 0	B. 2: 0	B. 1: 0*	B. 1: 0 B. 6: 0 B. 11: 0	
Carabelli's trait (0–7)	B. 3: 0 B. 6: 0	B. 2: 0		B. 1: 0 B. 6: 0 B. 11: 0	
enamel extensions (0–3)	B. 3: 0 B. 6: 0	B. 2: 1		B. 1: 0 B. 6: 0 B. 11: 0	

Table 29, continued

	41DT80	41DT124	41HP78	41HP102	41HP106
LEFT MANDIBULAR					
M3					
groove pattern (Y, +, X)	B. 6: 0	B. 2: 0	B. 3: 0	B. 1: 3 B. 6: 0 B. 11: 0 B. 13: 0	
cusp number (4–6)	B. 6: 0	B. 2: 0	B. 3: 0	B. 1: 4 B. 6: 0 B. 11: 0 B. 13: 0	
protostylid (0–7)	B. 6: 0	B. 2: 0	B. 3: 0	B. 1: 0 B. 6: 0 B. 11: 0 B. 13: 0	
cusp 5 (0–5)	B. 6: 0	B. 2: 0	B. 3: 0	B. 1: 0 B. 6: 0 B. 11: 0 B. 13: 0	
cusp 6 (0–5)	B. 6: 0	B. 2: 0	B. 3: 0	B. 1: 0 B. 6: 0 B. 11: 0 B. 13: 0	
cusp 7 (0–4)	B. 6: 0	B. 2: 0	B. 3: 0	B. 1: 0 B. 6: 0 B. 11: 0 B. 13: 0	
molar root number (1–3)	B. 6: 0	B. 2: 2	B. 3: 2	B. 1: 2 B. 6: 2 B. 11: 0 B. 13: 2	
M2					
groove pattern (Y, +, X)	B. 3: 1 B. 4: 0 B. 5a: 1* B. 6: 3	B. 2: 0	B. 1: 2* B. 3: 0	B. 1: 2 B. 4: 0 B. 6: 0 B. 11: 0 B. 13: 0	
cusp number (4–6)	B. 3: 5 B. 4: 0 B. 5a: 4* B. 6: 4	B. 2: 0	B. 1: 5* B. 3: 0	B. 1: 4 B. 4: 0 B. 6: 0 B. 11: 0 B. 13: 0	

Table 29, continued

	41DT80	41DT124	41HP78	41HP102	41HP106
protostylid (0–7)	B. 3: 0 B. 4: 0 B. 5a: 0* B. 6: 1	B. 2: 0	B. 1: 0* B. 3: 0	B. 1: 0 B. 4: 0 B. 6: 0 B. 11: 0 B. 13: 0	
cusp 5 (0–5)	B. 3: 2 B. 4: 0 B. 6: 0	B. 2: 0	B. 3: 0	B. 1: 0 B. 4: 0 B. 6: 0 B. 11: 0 B. 13: 0	
cusp 6 (0–5)	B. 3: 0 B. 4: 0 B. 5a: 0* B. 6: 0	B. 2: 0	B. 3: 0	B. 1: 0 B. 4: 0 B. 6: 0 B. 11: 0 B. 13: 0	
cusp 7 (0–4)	B. 3: 0 B. 4: 0 B. 5a: 0* B. 6: 0	B. 2: 0	B. 1: 0* B. 3: 0	B. 1: 0 B. 4: 0 B. 6: 0 B. 11: 0 B. 13: 0	
molar root number (1–3)	B. 3: 0 B. 4: 1 B. 6: 2	B. 2: 1	B. 3: 2	B. 1: 2 B. 4: 0 B. 6: 2 B. 11: 0 B. 13: 1	
M1					
groove pattern (Y, +, X)	B. 3: 3 B. 6: 1	B. 2: 0	B. 1: 1* B. 3: 0	B. 1: 0 B. 4: 1 B. 6: 0 B. 11: 0 B. 13: 0	
cusp number (4–6)	B. 3: 6 B. 6: 5	B. 2: 0	B. 1: 5* B. 3: 0	B. 1: 0 B. 4: 5 B. 6: 0 B. 11: 0 B. 13: 0	
protostylid (0–7)	B. 3: 0 B. 6: 0	B. 2: 0	B. 1: 0* B. 3: 0	B. 1: 0 B. 4: 1 B. 6: 0 B. 11: 0 B. 13: 0	
cusp 5 (0–5)	B. 3: 0 B. 6: 0	B. 2: 0	B. 3: 0	B. 1: 0 B. 4: 5 B. 6: 0 B. 11: 0 B. 13: 0	

Table 29, continued

	41DT80	41DT124	41HP78	41HP102	41HP106
cusp 6 (0–5)	B. 3: 3 B. 6: 0	B. 2: 0	B. 1: 0* B. 3: 0	B. 1: 0 B. 4: 0 B. 6: 0 B. 11: 0 B. 13: 0	
cusp 7 (0–4)	B. 3: 0 B. 6: 0	B. 2: 0	B. 1: 0* B. 3: 0	B. 1: 0 B. 4: 0 B. 6: 0 B. 11: 0 B. 13: 0	
molar root number (1–3)	B. 3: 0 B. 6: 2	B. 2: 0	B. 3: 2	B. 1: 2 B. 4: 0 B. 6: 2 B. 11: 0 B. 13: 2	
P1					
premolar root number (0–5)	B. 3: 0 B. 4: 0 B. 6: 0	B. 2: 1	B. 3: 0	B. 1: 0 B. 5: 0 B. 6: 1 B. 13: 0	
RIGHT MANDIBULAR					
P1					
premolar root number (0–5)	B. 3: 0 B. 4: 0 B. 6: 0	B. 2: 1	B. 3: 0	B. 1: 0 B. 6: 0 B. 13: 0	
M1					
groove pattern (Y, +, X)	B. 3: 3 B. 5a: 1* B. 6: 1	B. 2: 0	B. 1: 1*	B. 1: 0 B. 4: 1 B. 6: 0 B. 11: 0	
cusp number (4–6)	B. 3: 6 B. 5a: 6* B. 6: 5	B. 2: 0	B. 1: 6*	B. 1: 5 B. 4: 5 B. 6: 0 B. 11: 0	
protostylid (0–7)	B. 3: 0 B. 5a: 0* B. 6: 0	B. 2: 0	B. 1: 0*	B. 1: 3 B. 4: 1 B. 6: 0 B. 11: 0	
cusp 5 (0–5)	B. 3: 0 B. 6: 0	B. 2: 0		B. 1: 0 B. 4: 4 B. 6: 0 B. 11: 0	

Table 29, continued

	41DT80	41DT124	41HP78	41HP102	41HP106
cusp 6 (0–5)	B. 3: 3 B. 5a: 2* B. 6: 0	B. 2: 0	B. 1: 3*	B. 1: 0 B. 4: 0 B. 6: 0 B. 11: 0	
cusp 7 (0–4)	B. 3: 0 B. 5a: 0* B. 6: 0	B. 2: 0	B. 1: 0*	B. 1: 0 B. 4: 0 B. 6: 0 B. 11: 0	
molar root number (1–3)	B. 3: 0 B. 6: 2	B. 2: 0		B. 1: 2 B. 4: 0 B. 6: 2 B. 11: 0	
M2					
groove pattern (Y, +, X)	B. 3: 2 B. 4: 0 B. 5a: 1* B. 6: 2	B. 2: 0		B. 1: 2 B. 4: 0 B. 6: 0 B. 11: 0	
cusp number (4–6)	B. 3: 5 B. 4: 0 B. 5a: 4* B. 6: 4	B. 2: 0	B. 1: 6*	B. 1: 4 B. 4: 0 B. 6: 0 B. 11: 0	
protostylid (0–7)	B. 3: 0 B. 4: 0 B. 5a: 0* B. 6: 1	B. 2: 0	B. 1: 0*	B. 1: 0 B. 4: 0 B. 6: 0 B. 11: 0	
cusp 5 (0–5)	B. 3: 2 B. 4: 0 B. 6: 0	B. 2: 0		B. 1: 0 B. 4: 0 B. 6: 0 B. 11: 0	
cusp 6 (0–5)	B. 3: 0 B. 4: 0 B. 5a: 0* B. 6: 0	B. 2: 0	B. 1: 3*	B. 1: 0 B. 4: 0 B. 6: 0 B. 11: 0	
cusp 7 (0–4)	B. 3: 0 B. 4: 0 B. 5a: 0* B. 6: 0	B. 2: 0	B. 1: 0*	B. 1: 0 B. 4: 0 B. 6: 0 B. 11: 0	
molar root number (1–3)	B. 3: 0 B. 4: 1 B. 6: 2	B. 2: 1		B. 1: 2 B. 4: 0 B. 6: 2 B. 11: 0	

Table 29, continued

	41DT80	41DT124	41HP78	41HP102	41HP106
M3					
groove pattern (Y, +, X)	B. 3: 3 B. 6: 0	B. 2: 0	B. 1: 2*	B. 1: 0 B. 5: 0 B. 6: 0 B. 13: 0	
cusp number (4–6)	B. 3: 6 B. 6: 0	B. 2: 0		B. 1: 4 B. 5: 0 B. 6: 0 B. 13: 0	
protostylid (0–7)	B. 3: 0 B. 6: 0	B. 2: 0		B. 1: 0 B. 5: 0 B. 6: 0 B. 13: 0	
cusp 5 (0–5)	B. 3: 0 B. 6: 0	B. 2: 0		B. 1: 0 B. 5: 0 B. 6: 0 B. 13: 0	
cusp 6 (0–5)	B. 3: 1 B. 6: 0	B. 2: 0		B. 1: 0 B. 5: 0 B. 6: 0 B. 13: 0	
cusp 7 (0–4)	B. 3: 0 B. 6: 0	B. 2: 0		B. 1: 0 B. 5: 0 B. 6: 0 B. 13: 0	
molar root number (1–3)	B. 3: 2 B. 6: 0	B. 2: 1		B. 1: 2 B. 5: 1 B. 6: 2 B. 13: 2	

TABLE 30

AVERAGE AGE OF DEATH CALCULATED FROM PRESENTED DATA

Site	Average Age of Death, Total	Adult Average Age of Death
41DT1	28.5	40
41DT6	37.8	37.8
41DT16	7.6	24.5
41DT80	20.1	49.8
41DT124	41.2	41.2
41HP78	21	42
41HP102	33	46.4
41HP105	55	55
41HP106*	32.5	43.8

*Calculations from 41HP106 should be considered rough approximations since numeric age is not presented by Gill-King (1990).

TABLE 31

MEAN SCORES OF DENTAL WEAR PER INDIVIDUAL

Site	Burial No.	Average Wear*	Average Wear**
41DT1	2 or 3***	7.8	39
41DT6	2	7	30.5
41DT16	F.6A	4.3	
41DT80	1	6.1	36.2
	4	7.6	34
	4 (SMU)	–	34
	site average	6.9	34.7
41DT124	2	4.6	15.1
41HP78	1	–	10.1
	3	–	33.3
	site average	–	21.7
41HP102	1	4	12.2
	2	7.8	38
	3	7	39.5
	5	7.6	23
	6	4.7	20.4
	8	7	–
	9	5.3	30.2
	11	5.8	26.1
	12	7.6	34.3
	13	6.7	37.7
	site average	6.3	24.6
41HP105	1	7.2	35.2
	3	6.2	36.3
	site average	6.7	35.8
41HP106	1		28.7
	3	5	27
	site average	5	27.9

*Scores based on Smith's (1984) scale of 0 to 8.

**Scores based on Scott's (1979) scale of 0 to 40.

***It was not possible to discern burial numbers associated with individuals analyzed by Wilson and Steele (1996).

Lake, although correlations are not terribly strong. Smith's (1984) technique produced slightly more robust results, yielding a Pearson's R value of 0.67, than Scott's (1979) which yielded a Pearson's R value of 0.57. However, since the best fit regression formula was being sought, individual teeth were tested to see which tooth or teeth correlate best with age. Since Smith's (1984) scoring method allows for the scoring of all teeth, it was used for this application. The best-represented teeth were selected for analysis, and that includes all teeth with more than 10 represented. The left maxillary second premolar is best represented, with 13 observations, followed by the right mandibular first premolar with 12 observations and the right mandibular canine with 11 observations. Correlations are much lower for

TABLE 32

MEAN DENTAL WEAR SCORES

Time Period	Average Age at Death	Mean Wear*	Mean Wear**
Woodland or early Caddoan	42.2	23.9	5.2
Early Caddoan	43.2	28.3	6.0
Early-middle Caddoan	35	27	5.0

Note: Mean wear scores use Scott's (1979)* and Smith's (1984)** techniques. Wear scores differ little and may be the result of sample size since there are only 4 individuals in the first category, 1 in the last, and 17 in the early Caddoan time period.

individual teeth, with LP^2 yielding a Pearson's R of 0.38, RP_1 yielding a Pearson's R of 0.53, and RC_1 yielding a Pearson's R of 0.37.

Rates of attrition can be correlated with the amount of grit and unprocessed vegetable fiber in the diet. It was expected that wear in this population would be dependent on subsistence strategy, differing between Caddoan agriculturalists and hunter-gatherers. Archeological and ethnohistoric evidence suggests that there should be a low quantity of grit in Caddoan diets compared with their hunter-gatherer predecessors. Powell (1985) found significantly higher attrition in the Fourche Maline populations examined compared to her Caddoan sample. Burnett (1990:413) documented a decrease in wear from heavy to moderate in the transition from Woodland to Caddoan time periods. However, her results are not confirmed in this study. Individuals were divided into three time periods: early Caddoan or Woodland, early Caddoan, and early-middle Caddoan. No statistically significant difference in dental attrition could be found between time periods (see Table 32), which may be a result of the small sample sizes. This suggests that there was no significant change in coarseness of the diet and/or food-processing techniques in the Cooper Lake region during the time period represented. The mean scores presented here are considerably higher than those presented for other Caddoan sites, e.g., by Burnett (1988) for Middle Ouachita region sites and by Wilson (1995) for the Sanders and Mitchell sites.

Caries frequencies and rates can be used as a rough discriminator between hunter-gatherers and agriculturalists (Rose and Marks 1985; Rose et al. 1984; Turner 1979). There are two basic components to consider in examining caries frequency. One is age and the second is diet. A sticky carbohydrate-rich diet high in sucrose should produce a relatively high rate of caries. Bacteria (*Lactobacillus acidophilus, Streptococcus mutans)* in the mouth convert the sucrose in maize into an acid that destroys enamel and dentin (Molnar 1971; Powell 1985).

The frequencies of caries in the Cooper Lake sample fall within the maize agriculture range of 8 to 25 percent (Cohen and Armelagos 1984; Powell 1985; Turner 1979). Of the 467 teeth examined for caries, 10.5 percent are carious, although there is tremendous individual variation that ranges from 0 to 53.3 percent. The 88 teeth dated to the Woodland or early Caddoan period have a caries frequency of 23 percent, which decreases to 8.4 percent in the early Caddoan period sample represented by 336 teeth. The 10 teeth dated to the early-middle Caddoan period have no caries.

Sixty-two percent of the 26 adults who had observable teeth had at least one dental caries (Table 33). All 7 individuals within the Woodland or early Caddoan period sample had at least one caries, while 56 percent of the 16 individuals in the early Caddoan period sample had at least one caries. Among other investigations of Caddoan sites, caries frequencies vary greatly. This may be an artifact of the kind of sampling that has taken place in the Caddo region more than actual frequencies. Powell (1985:327) found 25.3 percent of the teeth from her Caddoan sample carious, and 90.6 percent of the individuals examined had caries. In an earlier Caddoan sample, Powell and Rogers (1980) found 43.4 percent of the teeth examined to be carious, and again 90.6 percent of the individuals had caries. Other comparative data come from the Belcher Mound, Bentsen-Clark, and Sam Kaufman sites where carious teeth are 10.7, 14.1, and 16.2 percent, respectively (Buikstra and Fowler 1975; Butler 1969; Webb 1959).

Others have used what is identified as a caries rate for comparison. The caries rate is equal to the number of caries divided by the number of individuals in the population. Rose and Marks (1985) use a caries rate of 2.0 to differentiate between a high

TABLE 33

SUMMARY OF ADULT DENTAL DATA

Site	Burial No.	Teeth Present	Antemortem Tooth Loss	Caries	Abscess
41DT1	1(SMU)*	10	1	3	0
41DT6	2	3	13	0	0
	3*	9	3	2	4
41DT16	F.6a**	22	1	6	0
41DT80	1	13	0	1	2
	3	26	0	2	0
	4	18	8	2	2
41DT124	2	30	0	0	0
41HP78	1***	29	–	4	–
	3	8	0	3	1
41HP102	1	28	0	8	1
	2	16	9	0	8
	3	3	0	0	0
	5	6	16	0	0
	6	22	0	0	0
	8	1	0	0	0
	9	15	4	8	3
	11	22	2	1	1
	12	26	2	1	1
	13	23	7	2	6
41HP105	1	12	0	1	2
	3	6	7	1	2
41HP106	1	7	0	1	2
	3	3	0	0	0
	5	4	0	0	1
	13	3	0	0	0

*Recorded by Westbury (1978).

**Recorded by Derrick and Steele (1993)

***Recorded by Burnett and Harmon (1989) without antemortem loss or abscess recorded.

and low carbohydrate diet. The caries rate in the Cooper Lake adult population as a whole is 1.8, thus falling just below what Rose and Marks (1985) identify as indicative of a high carbohydrate diet. This is close to the overall rate of 1.9 caries per individual calculated for early and middle Caddoan and terminal Fourche Maline populations in the Little River, Red River, Cypress Creek,Sabine River, and Neches River basins using data presented by Burnett (1990:Table 118). Further, it is intermediate between the rates for Fourche Maline/Woodland (0.4) and late Caddoan (2.8) populations based on Burnett's data.

Females have higher caries rates than males at the Cooper Lake sites. The 9 adult females have a caries rate of 2.7, while the 13 males have a caries rate of 1.0. This difference is statistically significant in a chi-square test at the .05 level. While the difference between females and males may reflect a difference in diet, among most archeological and modern populations caries rates appear to be higher among females than males and may be the result of

differential metabolic demands (Hillson 1986; Walker 1986).

Caries should be age progressive, but regression analysis indicates that this is not so among the Cooper Lake population (R = 0.02). The lack of relationship between age and caries may be a result of antemortem tooth loss, which itself may be the result of age and/or carious destruction.

Dental abscess frequency is also noted as an indication of oral health (see Table 33). Both periapical and alveolar abscesses were lumped into one category since both can be caused by a number of factors including periodontal disease and exposure of the pulp cavity (Ortner and Putschar 1981). The frequency of dental abscess is relatively high, with 60 percent of the 25 adults with dental remains affected. A total of 36 abscesses were found in 14 individuals. This frequency is much higher than reported by Burnett (1990) for populations from northeastern Texas.

Antemortem tooth loss is typically associated with age, carious activity, and periodontal disease. It was assumed that antemortem loss would increase with age. However, in the Cooper Lake population these relationships could not be strictly determined. Antemortem tooth loss is only weakly related to age at death. Dental abscesses are not correlated with caries frequencies or dental wear (Pearson's R values are 0.14 and 0.36, respectively).

While 336 adult teeth are present, 73 had been lost prior to death (see Table 33), yielding a loss of 21.7 percent. This is much greater than that reported by Burnett (1990) in her study of populations from northeastern Texas. Peak antemortem tooth loss is in the oldest age category represented, 50–59 years.

Antemortem tooth loss is perhaps most directly the result of periodontal disease (Hillson 1986). Antemortem tooth loss was higher among males than females. The 9 females had lost 29 teeth prior to death, while the 13 males had lost 43 teeth prior to death. These results may indicate a higher rate of periodontal disease for both females and males from the Cooper Lake region than among other contemporaneous groups in northeastern Texas.

Gill-King (1990:251) reports on the stable isotope analysis of six individuals from the Hurricane Hill site (41HP106) (Table 34). His report is summarized and reinterpreted in light of the dental data presented above.

Stable isotope analysis has long been used to examine the trophic levels of organisms. Gelatin values are reflective of isotopic composition of the organic fraction of bone, while apatite values reflect the isotopic composition of the mineral fraction. The two likely have differing turnover rates and reflect different aspects of the dietary whole (Ambrose 1993). The collagen enrichment factor, or the difference between the dietary and bone signature for carbon, is 5‰. Thus C_3 plants have a $\delta^{13}C$ gelatin signature of –26.5‰, and bone from a C_3 plant consumer would have a signature of –21.5‰. C_4 plants have a $\delta^{13}C$ gelatin signature of 12.5‰. It is currently believed that gelatin signatures reflect the protein sources, particularly in low protein diets as seen in North American maize agriculturalists (Ambrose 1993). The $\delta^{13}C$ gelatin signatures from the Hurricane Hill population indicate that some C_4 plant, most likely maize, contributed to their diet.

Nitrogen signatures are less understood, reflecting nitrogen-fixing plants such as beans, as well as relative amounts of protein (Schoeninger 1989). The

TABLE 34

STABLE ISOTOPE DATA FROM BURIALS AT 41HP106*

Burial No.	^{13}C Gelatin	^{13}C Apatite	^{13}C Difference	^{15}N Gelatin
1	–16.5	–9.6	–6.9	8.9
2	–15.3	–7.4	–7.9	8.9
4a	–15.3	–8.8	–6.5	9.0
4b	–17.6	–10.2	–7.4	8.4
13	–15.2	–7.3	–7.9	9.2
15	–15.0	–8.7	–6.3	9.1

*After Gill-King (1990:251). All results reported in parts per mil. $^{13}C/^{12}C$ standard is PDB; $^{15}N/^{14}N$ standard is atmospheric nitrogen.

similarity of the nitrogen signatures suggest a similar animal-protein intake in the diet of those buried at the Hurricane Hill site.

The difference between collagen and apatite $\delta^{13}C$ values is believed to represent the amount of protein in the diet, while $\delta^{15}N$ values may reflect the protein source. The smaller the difference, the greater amount of protein in the diet. Apatite signatures are believed to reflect the dietary whole, although they may be biased by carbohydrate and fat sources in low protein diets (Ambrose 1993). Apatite values indicate a significant C_4 plant carbohydrate and/or fat contribution to the diet. The different values for gelatin and apatite indicate a low protein diet for the Hurricane Hill population (see Table 34). Taken together, the stable isotope data suggest that the Hurricane Hill population had a low protein diet, with protein input from animal sources, and a large portion of carbohydrates and/or fat from maize, with a significant portion of the diet originating in C_3 plant sources. Interestingly, results reported by Tiné and Tieszen (1994:236) for the McLelland site indicate more-intensive maize utilization but a higher protein diet than found in the Hurricane Hill population located farther west and earlier in time.

The preceding analyses have confirmed that the expected dental disorders associated with transitional maize agriculture were present in the Cooper Lake populations. Although the caries rate falls just below the agricultural range of 2.3–26.9 percent (Turner 1979:624), females may have eaten more maize than males. This hypothesis is tentatively supported by the stable isotope analysis from the Hurricane Hill site, in which the only female analyzed (Burial 15) had slightly higher signatures than the males sampled (noting, however, that Burial 15 may date to the Woodland period and thus may be earlier than the other remains in the isotope analysis).

In the Caddoan archeological region, dental attrition declined with the adoption of maize agriculture due to the ingestion of more soft, starchy foods and replacement of stone grinding implements with wood. Dental attrition in the Cooper Lake region was higher than among other Caddoan populations and may be partly responsible for the lowered caries rate. Lowered attrition may increase the prevalence of caries since locations of caries remain in place longer. Additionally, abrasives may act to cleanse teeth of food particles (Powell 1985:323).

Abscess rates were high and well above the range of Caddoan values for all locations listed by Burnett (1990). Since rates of antemortem tooth loss were also high, the majority of teeth lost before death may have been the result of destruction of supporting structures from abscessing.

Stable isotope values and dental data are consistent with a transitional agricultural economy in which maize was incorporated into the diet but was not utilized as intensively as seen in later time periods and in Caddoan populations of the Red River (Wilson and Cargill 1993).

PALEOPATHOLOGY

The following section tests some of the tentative hypotheses put forth by Burnett (1990:401) in regard to the Cooper Lake skeletal series as compared to other skeletal series from northeastern Texas. Although Burnett's (1990) sample from the Cooper Lake region is small and highly variable, she found much higher rates of childhood stress and infection, suggesting to her that the Cooper Lake residents experienced high levels of physiological stress and were poorly adapted to their living conditions. In order to assess her findings, the incidence of enamel hypoplasias, infections, trauma, and arthritis was analyzed.

Enamel hypoplasia may be the best record of childhood stresses recorded in the human skeleton. Various stressful events can produce enamel defects during the time in which the enamel is being formed, and include infectious disease and malnutrition. Genetic factors and trauma may also impact enamel formation. The 33 individuals in this sample with dental remains had substantially lower rates of enamel hypoplasia than those reported by Burnett (1990) for the Cooper Lake sites, sites in the Red River drainage, and her combined sample of middle and late Caddoan time periods. In the sample summarized here, 36 percent of those with teeth had at least one hypoplasia, and of the 446 teeth, 12.5 percent had enamel hypoplasia. The differences in results are likely the result of small sample sizes.

Table 35 documents the variability among sites in rates of enamel hypoplasia. The intersite variation is likely a result of small sample sizes. There is no significant variability among the time periods represented.

Infectious disease can be used as one measure of health on both the individual and population level

TABLE 35

FREQUENCIES OF ENAMEL HYPOPLASIA

Site	Enamel Hypoplasia (% of individuals affected)	Enamel Hypoplasia (% of teeth)
41DT1	0	0
41DT6	0	0
41DT16	100	23.3
41DT80	42.9	17.6
41HP78*	100	–
41HP102	33.3	9.6
41HP105	100	16.7
41HP106	0	0

*Data from Burnett and Harmon (1989) in which it is not possible to determine percentage of teeth affected.

and may be influenced by genetic factors, nutritional status, population density of host and agent, as well as other behavioral and environmental influences. Most infectious diseases that affect the skeleton are chronic and debilitating, rather than immediately lethal, because many that are lethal affect the body too quickly to alter bone tissue. An additional difficulty in paleopathological analyses is that many bone lesions are nonspecific since bone lesions from a variety of conditions are often identical. Since this study emphasizes a population approach, rather than a specific disease diagnostic approach, the completeness of skeletons will influence infectious disease rates.

The infection rate found in this study (Table 36) is similar to that reported by Burnett (1990:401) for her Cooper Lake sample and much higher than that reported for other localities in northeastern Texas, with 48.1 percent of the individuals for which pathological assessments could be made affected by infectious bone growth. Sites range in frequencies of individuals infected from a low of 14.2 percent at 41DT80 to a high of 75 percent at 41DT1.

Because the data collection procedure employed in the reanalysis by Geo-Marine emphasizes population health rather than specific disease diagnosis, it is not possible to determine which infectious diseases affected the majority of the Cooper Lake skeletal series. Some of the published reports, however, do attempt to make specific diagnoses of diseases. Specific diagnoses offered by Westbury (1978) include a possible case of congenital syphilis in Burial 4 from 41HP102 and osteomyelitis in Burial 1 from 41HP105. Derrick and Steele (1993) report a possible case of treponematosis in Feature 1 from 41DT6 and a probable case of otitis media in Feature 7b from 41DT16. Burnett and Harmon (1989:12) felt that specific diagnosis is inappropriate in the case of infectious disease, although they offer two tentative cases of treponematosis in Burial 5a from 41DT80 and Burial 3 from 41HP78. Gill-King (1990) reports mastoiditis in Burials 2, 3, 4A, and 13 from 41HP106.

Traumatic injury can be the result of accident or violent bodily impact. Although it is often difficult for the paleopathologist to determine intent,

TABLE 36

SUMMARY OF PALEOPATHOLOGICAL DATA

Site	Infection (%)	Trauma (%)	Porotic Hyperostosis (%)	Degenerative Joint Disease (%)	Total Examined
41DT1	75	0	25	75	4
41DT6	25	25	0	25	4
41DT16	40	20	20	20	5
41DT80	14.2	0	0	0	7
41DT124	50	0	50	50	2
41HP78	20	0	20	20	5
41HP102	64.3	7.1	7.1	64.3	14
41HP105	67	0	0	67	3
41HP106	70	10	40	10	10
Totals:	48.1	9.2	18.5	38.9	54

as in the case of a parry fracture which can result from blocking a blow to the upper body or head as well as a fall, some cases are more clear as in certain depression fractures to the cranium. Traumatic injury does reveal something about the local environmental impacts to persons adapting to certain regions and resources in specific ways. Trauma, like infectious disease, is dependent on adequate skeletal inventories and thus may be underreported here.

The incidence of trauma among the Cooper Lake population is relatively high (see Table 37). Using Burnett's (1990:404) data from the eastern portion of the Gulf Coastal Plain, the Woodland and all Caddoan periods except the early and historic Caddoan periods have lower rates of trauma. The majority of the injuries reported for the Cooper Lake skeletal series appear to have been accidental. Derrick and Steele (1993:278) report localized trauma to the ribs and proximal right femur in Feature 1 of 41DT6 and multiple trauma in Feature 6a from 41DT16, including a dislocated jaw and fractures of the radius. Burial 1 from 41HP102 has a reported healed fracture of the left tibia. Gill-King (1990:248) reports a depressed fracture of the right parietal in Burial 13 from 41HP106.

Porotic hyperostosis has been used as an indicator of iron-deficient anemia, caused either through nutritional deficiency (El-Najjar et al. 1976) or parasite load (Kent 1986). Although higher than the majority of reported Caddoan populations, the incidence of porotic hyperostosis reported here (see Table 36) is substantially lower than that reported by Burnett (1990) for the Cooper Lake population; this can only be due to a difference in sample sizes and is comparable to the 20 percent she reports for the Blackland Prairie region. Within this sample, rates of porotic hyperostosis range from 0 to 50 percent but are likely strongly influenced by sample size. The mean incidence of porotic hyperostosis suggests that the Cooper Lake population did experience some difficulties with iron-deficient anemia.

Degenerative joint disease is commonly called arthritis, and here it refers to degenerative changes in the synovial joints as well as the vertebral column. Degenerative joint disease can be the result of single episodes of stress but more commonly reflects repeated stresses often associated with aging. As the joint capsule breaks down, bone responds either through expansion of the bony surface with marginal lipping, erosion of the joint surface, or eburnation, the polishing that results from direct bone to bone contact. Degenerative joint disease is often used as an indicator of biomechanical stress experienced by a population.

Observations of degenerative joint disease are dependent on preservation of joint surfaces—information that was not commonly recorded by analysts. Table 36 presents the percentages of individuals affected by degenerative joint disease but does not account for preservation of individuals or joint surfaces affected. The rate of 38.9 percent is nearly identical to the rate of 39.3 percent reported by Burnett (1990:416) for osteophytosis in the post oak region of the Gulf Coastal Plain, but it is lower than the 53.5 percent reported for the Blackland Prairie, where the Cooper Lake sites are located, and higher than the 13.2 percent reported for sites in the pine forest region. Compared to the rates of osteoarthritis reported by Burnett (1990:415), the Cooper Lake population falls between the Blackland Prairie (50 percent) and post oak (17.8 percent) populations and is still higher than that reported for the pine forest (2.1 percent) region. The rate of the Cooper Lake skeletal series is considerably lower than that reported by Wilson (1994) for the early Caddoan Sanders site population, which also had a lower mean age of death than the Cooper Lake population.

To reiterate, Burnett (1990) found much higher rates of childhood stress and infection, suggesting that the Cooper Lake residents experienced high levels of physiological stress and were poorly adapted to their living conditions. This analysis provides some support for her hypothesis but cannot support the generalization that the Cooper Lake residents were poorly adapted to their living environment. The high adult life expectancy alone calls into question the degree to which the Cooper Lake population was physiologically stressed compared to their neighbors, as possibly does the extent of the sexual dimorphism in the Cooper Lake assemblage.

Enamel hypoplasia data suggest that the Cooper Lake population experienced less childhood stress than neighboring populations in the Red River drainage basin. Since some of the best skeletal data in the Caddo region come from the Red River, the data from these sites may be more useful in generalizing about Caddoan populations than data from other river drainages where samples are considerably smaller and preservation poorer. Interestingly, rates of hypoplasia did not change through time and thus may not have been affected by the adoption of maize agriculture.

Despite the low incidence of violent injury found in the Cooper Lake skeletal series, traumatic injury may be related to social stress. Indicative of this is Burnett's (1990) report that the highest rates are in the early and historic Caddoan periods, both of which would be expected to have been times of high social stress. Most of the Cooper Lake skeletal series are from the early Caddoan period and thus may have experienced a trauma rate similar to other contemporaneous Caddoan populations.

The higher rate of infection found at Cooper Lake compared to other Caddoan populations is curious if Cooper Lake had a lower population density than more-eastern Caddoan populations. A lower population density would be expected to result in different types of infection by reducing the types of infection spread through direct human contact and through human waste. However, an examination of the diagnoses suggests that half of the infections reported are treponemal, which is spread through direct and indirect human contact. A slight temporal trend of increased infection associated with early Caddoan times is evident in Burnett's (1990) data, and again this may be represented in the Cooper Lake material as well.

Both porotic hyperostosis and degenerative joint disease are intermediate among the Cooper Lake population when compared to other Caddoan populations. Neither of these indicators of stress show clear temporal trends in Burnett's (1990) report. Thus, it is our conclusion that the Cooper Lake populations were not significantly more physiologically stressed by their living environment than other populations of the early Caddoan time period.

CULTURAL MODIFICATION

Cultural modification of the body is an effective form of group identification in human societies and should be useful to archeologists in reconstructions of ethnic and group identity. Cranial modeling and dental modification are two of the most common forms of body adornment that are preserved in hard tissue remains and thus available to the archeologist for study. Cranial modeling was practiced by the Caddo and documented both archeologically (Derrick and Wilson 1996) and ethnohistorically (Swanton 1942). Since cranial modeling occurs early in life, when an infant's cranial bones are relatively pliable, cranial modeling reflects the group identification to which parents wish their children to be perceived as belonging.

Table 37 documents that in this study only five individuals from Cooper Lake could be identified as exhibiting cranial alteration, and only three of these individuals exhibit cranial modeling (Derrick and Wilson 1996 report differing results; see Table 37). Lambdoid flattening is largely the result of hard-surfaced infant carrying and sleeping postures and devices and therefore should not be confused with the intentional shaping of an infant's head to produce a desired form. The Cooper Lake region is the only portion of the Caddoan archeological region where lambdoid flattening is present, suggesting that a difference in child-rearing practices existed between the residents of the Cooper Lake region during early Caddoan times and other locales in the greater Caddoan archeological region (Derrick and Wilson 1996). Since all but two fragmentary

TABLE 37

CRANIAL MODELING AND LAMBDOID FLATTENING FOUND IN THE COOPER LAKE SKELETAL SERIES

	41DT6	41DT80	41HP102	41HP105
Natural lambdoid		Burial 2		Burial 1
Bifronto-occipital	Feature 1*			
Annular fronto-vertico-occipital		Burial 1**	Burial 5**	

*Reported by Derrick and Steele (1993).

**Reported by Derrick and Wilson (1996) but not reported in the reanalysis by Geo-Marine, Inc. Derrick and Wilson (1996) also report a higher incidence of lambdoid flattening (8 of 12 for which observations were possible) in these sites than presented in the reports reviewed here.

individuals date to early Caddoan and early Caddoan or Woodland times, the paucity of cranial modeling in this region is consistent with the model proposed by Derrick and Wilson (1996) that suggests the practice spread from east to west beginning in early Caddoan times, with cranial modeling not seen in the western portion of the Caddoan archeological region until the early middle Caddoan period.

SUMMARY AND CONCLUSIONS

A minimum of 75 individuals have been recovered from nine sites at Cooper Lake. While most of these individuals were recovered from single-interment, primary burials, some were recovered from primary burials where the remains of two or more individuals were represented (n = 12), from cremation burials (n = 13), or from possible bundle burials (n = 6).

The state of preservation of the remains recovered ranges from poor to moderately good. Site 41HP106 has the poorest state of preservation with an average of approximately 10 percent of the skeleton preserved per individual, and sites 41DT6 and 41HP102 have the highest recorded state of preservation with 44–45 percent of the individual preserved. Because of the generally poor state of preservation, many metric and nonmetric observations could not be made on the skeletons.

Because of the small sample size per site, data were pooled to provide an estimate of stature and body size. Since the temporal range of the sites at Cooper Lake is relatively small, this probably does not distort the parameters of the population in a significant way. Based upon this combined assemblage, male stature is estimated to be 172.5 ± 3.4 cm, while estimates of the stature of females range from 157.7 ± 3.8 cm to 164.3 ± 3.5 cm. Estimates of the degree of male/female sexual dimorphism range from 106.1 to 114. These estimates indicate a relatively marked degree of sexual dimorphism in the Caddoan population, but it cannot be determined if the greater differences are due to greater variance in the males or the females. However, assuming that the females were near optimal body size for reproduction, an assumption made in many models assessing sexual dimorphism, then the corresponding large size of the males would suggest that the Cooper Lake population was not nutritionally stressed.

Concerning the issue of the genetic relationships of the Cooper Lake population to nearby populations, the question has been raised whether the Cooper Lake population was a westward extension of the Caddoan population or a biologically distinct population that had adopted a Caddoan lifestyle. The scope of this project only permits presentation of the data of the Cooper Lake assemblages for future bioarcheologists to use.

Related to the question of the genetic affiliation of the Cooper Lake population is the question of their cultural affiliation. Burnett (1990:418) states that the cultural affiliation of the Cooper Lake inhabitants is undefined. While the results presented here must be considered preliminary because of small sample sizes and poor preservation, they take a first step toward resolution of the issue of cultural affiliation.

Of the minimum number of 75 individuals recorded in Table 15 as being recovered from the Cooper Lake area, 8 have never been analyzed and are not available for analysis. Of the 67 remaining individuals, a minimum of 13 are cremations which provide limited data toward the interpretations offered here. An additional 12 individuals are from burials that contained the remains of two or more individuals, and usually all but one of the individuals in these multiple burials are represented by fragments of the skeleton only. The remaining small sample precludes examining possible differences among sites at Cooper Lake. Nine sites are represented by these remains, the largest samples coming from 41HP102 and 41HP106, although many burials from 41HP106 are cremations. Another drawback to this study, that may ultimately provide insight into the question of Cooper Lake affiliation, is the time period represented by this sample. A limited amount of time is represented by the burials (i.e., most are assigned to the early Caddoan period or to the grosser Woodland-early Caddoan interval), and most may be considered transitional agriculturalists, a factor supported by dental and stable isotope data.

The temporal homogeneity of this sample in a time of transitional food economy may, in part, explain the high incidence of disorders reported by Burnett (1990) for the Cooper Lake series, if, as Cook and Buikstra (1979) suggest, stress should be highest in times of social transition. In nearly all cases, rates of disorders are similar to those reported by Burnett (1990) for early Caddoan time periods. One notable exception to this pattern is the incidence of enamel hypoplasia, which is lower than that

reported by Burnett (1990) for middle and late Caddoan populations. A number of factors could explain the lower incidence of hypoplasia, including lack of maize gruel as a sole nutritional source during weaning. Infection rates are higher in the Cooper Lake population than those reported by Burnett (1990) for other populations from the region, but they are most similar to rates found along the Red River during early Caddoan times. Rates of degenerative joint disease are slightly higher but most similar to those reported by Burnett (1990) for early Caddoan periods and differ radically from those reported by Reinhard et al. (1990) for hunter-gatherers from regions south and west of Cooper Lake.

In order to test the preliminary conclusions that the Cooper Lake skeletal series is much more similar to transitionally agricultural early Caddoan populations than hunter-gatherers to the south and west, larger samples will have to be analyzed thoroughly and compared with the data presented here. Use of standard methods, as those utilized in the reanalysis of remains by Geo-Marine, provides more data useful to future synthesis than many of the earlier published reports but still requires refinement. Many of these refinements need to be made in the documentation of inventory style, pathological diagnosis, and cranial modeling. Studies like this one not only point out the benefits of using standard techniques in bioarcheology but also indicate some of the shortcomings of the specific techniques employed here.

REFERENCES CITED

Ambrose, S. H.
1993 Isotopic Analysis of Paleodiets: Methodological and Interpretive Consideration. In *Investigations of Ancient Human Tissue Chemical Analyses in Anthropology*, edited by M. K. Sandford, pp. 59–130. Gordon and Breach, Langhorne, Pennsylvania.

Anderson, J. E.
1962 *The Human Skeleton: A Manual for Archaeologists*. National Museum of Canada.

Bass, W. F.
1971 *Human Osteology: A Laboratory and Field Manual of the Human Skeleton*. 2nd ed. Missouri Archeological Society, Columbia.

Brothwell, D. R.
1965 *Digging Up Bones*. British Museum, London.

Buikstra, J., and D. Fowler
1975 An Osteological Study of the Human Skeletal Material from the Bentsen-Clark Site. In *The Bentsen-Clark Site, Red River County, Texas*, by L. Banks and J. Winters, pp. 79–97. Special Publication No. 2. Texas Archeological Society.

Buikstra, J., and D. Ubelaker (editors)
1994 *Standards for Data Collection from Human Skeletal Remains*. Research Series No. 44. Arkansas Archeological Survey, Fayetteville.

Burnett, B. A.
1988 Bioarcheology of Standridge and the Middle Ourchita Caddoan. In *Standridge: Caddoan Settlement in a Mountain Environment*, edited by A. Early, pp. 143–153. Research Series No. 29. Arkansas Archeological Survey, Fayetteville.

1990 The Bioarchaeological Synthesis of the Eastern Portion of the Gulf Coastal Plain. In *The Archeology and Bioarcheology of the Gulf Coastal Plain: Volume 2*, by Dee Ann Story, Janice A. Guy, Barbara A. Burnett, Martha Doty Freeman, Jerome C. Rose, D. Gentry Steele, Ben W. Olive, and Karl J. Reinhard, pp. 385–418. Research Series No. 38. Arkansas Archeological Survey, Fayetteville.

Burnett, B. A., and A. Harmon
1989 Appendix C: Descriptive Osteology of 41DT80, 41DT124, and 41HP78. In *Archaeological Investigation at Cooper Lake: 1987 Season* (review draft), Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators, pp. C-1 through C-57. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

Butler, B. H.
1969 Analysis of the Human Skeletal Remains. In *Archaeological Investigations at the Sam Kaufman Site, Red River County, Texas*, edited by S. N. Skinner, R. K. Harris, and K. M. Anderson, pp. 115–136. Contributions in Anthropology 5. Southern Methodist University, Dallas.

1982 Appendix: Human Skeletal Material from the Loeve-Fox Site (41WM230). In *Archaeological Investigations at the San Gabriel Reservoir District, Central Texas, Volume 4*. Institute of Applied Sciences, North Texas State University, Denton.

Cliff, Maynard B.
1989 Archaeological Investigations at the Thomas Site (41DT80). In *Archaeological Investigations at Cooper Lake: 1987 season* (review draft), by Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators, pp. 6-1 through 6-145. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

Cohen, M. N., And G. J. Armelagos
1984 *Paleopathology at the Origins of Agriculture*. Academic Press, New York.

Cook, D. C., and J. E. Buikstra
1979 Health and Differential Survival in Prehistoric Populations: Prenatal Dental Defects. *American Journal of Physical Anthropology* 51:649–664.

Derrick, S., and D. G. Steele
1993 Analysis of Human Remains from 41DT6 and 41DT16. In *Excavations at the Tick, Spike, Johns Creek, and Peerless Bottoms Sites*, by Ross C. Fields, Eloise F. Gadus, L. Wayne Klement, C. Britt Bousman, and Jerrilyn B. McLerran, pp. 271–186. Reports of Investiga-

tions No. 91. Prewitt and Associates, Inc., Austin, Texas.

Derrick, S. M., and D. E. Wilson
1996 Cranial Modeling as an Ethnic Marker Among the Caddo. Paper presented at the 1996 Society of American Archaeology Annual Meeting, New Orleans.

Doehner, Karen, and Richard E. Larson
1978 *Archaeological Research at the Proposed Cooper Lake, Northeast Texas, 1974–1975.* Research Report 108. Archaeology Research Program, Southern Methodist University, Dallas.

Doran, G.
1975 *The Long Bones of the Texas Indians.* Unpublished Masters thesis, Department of Anthropology, University of Texas, Austin.

El-Najjar, M. Y., D. J. Ryan, C. Turner, and B. Lozoff
1976 The Etiology of Porotic Hyperostosis among the Historic and Prehistoric Anasazi Indians of the Southwestern United States. *American Journal of Physical Anthropology* 44:477–488.

Fields, Ross C., Eloise F. Gadus, L. Wayne Klement, C. Britt Bousman, and Jerrilyn B. McLerran
1993 *Excavations at the Tick, Spike, Johns Creek, and Peerless Bottoms Sites, Cooper Lake Project, Delta and Hopkins Counties, Texas.* Reports of Investigations No. 91. Prewitt and Associates, Inc., Austin.

Genovese, S. C.
1967 Proportionality of Long Bones and Their Relation to Stature among Mesoamericans. *American Journal of Physical Anthropology* 26:67–78.

Giles, E.
1961 Sex Determination by Discriminant Function Analysis of the Mandible. *American Journal of Physical Anthropology* 22:1129–135.

Giles, E., and O. Elliot
1965 Sex Determination by Discriminant Function Analysis of Crania. *American Journal of Physical Anthropology* 21:53–68.

Gill-King, H.
1990 Human Skeletal Remains: Pathological and Dietary/Nutritional Aspects. In *The Hurricane Hill Site (41HP106): Excavations at Cooper Lake, Hopkins County, Texas* (review draft), by Timothy K. Perttula, pp. 235–255. Contributions in Archaeology No. 9. Institute of Applied Sciences, University of North Texas, Denton.

Harris, R. K.
1955 A Flexed Burial Site, 19C5-15, Delta County, Texas. *The Record, Newsletter of the Dallas Archeological Society* 14(2):8–10.

Hatzenbuehler, R.
1953 A Flexed Burial, Delta County, Texas. *The Record, Newsletter of the Dallas Archeological Society* 11(4):16–17.

Hillson, S. W.
1986 *Teeth.* Cambridge University Press, Cambridge.

Hyatt, Robert D., Barbara H. Butler, and Herbert P. Mosca, III
1974 *Archaeological Research at Cooper Lake, 1970–1972.* Contributions in Anthropology No. 12. Southern Methodist University, Dallas.

Hyatt, Robert D., and Karen Doehner
1975 *Archaeological Research at Cooper Lake, Northeast Texas, 1973.* Contributions in Anthropology No. 15. Southern Methodist University, Dallas.

Johnson, L., Jr.
1962 The Yarbrough and Miller Sites of Northeastern Texas, with a Preliminary Definition of the La Harpe Aspect. *Bulletin of the Texas Archeological Society* 32:141–284.

Kent, S.
1986 The Influence of Sedentism and Aggregation on Porotic Hyperostosis and Anemia: A Case Study. *MAN* 21:605–636.

Krogman, W. M.
1962 *The Human Skeleton in Forensic Medicine.* Charles C. Thomas, Springfield, Illinois.

Kronfield, R.
1954 Development and Calcification of the Human Deciduous and Permanent Dentition. In *Basic Readings on the Identification of Human Skeletons*, by T. D. Stewart, pp. 3–34. Wenner-Gren Foundation, New York.

Martin, William A.
1989a Archaeological Investigations at the Doctors Creek Site (41DT124). In *Archaeological Investigations at Cooper Lake: 1987 Season*

(review draft), by Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators, pp. 7-1 athrough 7-110. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

1989b Archaeological Investigations at the Lawson Site (41HP78). In *Archaeological Investigations at Cooper Lake: 1987 Season* (review draft), by Randall W. Moir, Daniel E. McGregor, and David H. Jurney, Co-Principal Investigators, pp. 9-1 athrough 9-93. Archaeology Research Program, Institute for the Study of Earth and Man, Southern Methodist University, Dallas.

Molnar S.
1971 Human Tooth Wear, Tooth Function and Cultural Variability. *American Journal of Physical Anthropology* 34:27–42.

Ortner D. J., and W. G. J. Putschar
1981 *Identification of Pathological Conditions in Human Skeletal Remains*. Smithsonian Contributions to Anthropology No. 57. Smithsonian Institution, Washington, D. C.

Pearson, K.
1917–1919 *A Study of the Long Bones of the English Skeleton: The Femur*. Company Research Memoirs Biometrics Series X, pp. 1–4. Department of Applied Sciences, University of London, University College.

Perttula, Timothy K.
1990 *The Hurricane Hill Site (41HP106): Excavations at Cooper Lake, Hopkins County, Texas* (second draft). Contributions in Archaeology No. 9. Institute of Applied Sciences, University of North Texas, Denton.

Powell, M. L.
1985 The Analysis of Dental Wear and Caries for Dietary Reconstruction. In *The Analysis of Prehistoric Diets*, edited by R. I. Gilbert Jr. and J. H. Mielke, pp. 307–338. Academic Press, Orlando.

Powell M. L., and J. D. Rogers
1980 *Bioarchaeology of the McCutchan-McLaughlin Site (LAD-11): Biophysical and Mortuary Variability in Eastern Oklahoma*. Studies in Oklahoma's Past No. 5. University of Oklahoma, Norman.

Reinhard, K. J., B. W. Olive, and D. G. Steele
1990 Part 2: The Bioarchaeological Synthesis of the Western Portion of the Gulf Coastal Plain. In *The Archeology and Bioarcheology of the Gulf Coastal Plain: Volume 2*, by Dee Ann Story, Janice A. Guy, Barbara A. Burnett, Martha Doty Freeman, Jerome C. Rose, D. Gentry Steele, Ben W. Olive, and Karl J. Reinhard, pp. 419–424. Research Series No. 38. Arkansas Archeological Survey, Fayetteville.

Rose, J. C., and B. A. Burnett
1990 Bioarcheology of the Eastern Portion of the Gulf Coastal Plain. In *The Archeology and Bioarcheology of the Gulf Coastal Plain: Volume 1*, by Dee Ann Story, Janice A. Guy, Barbara A. Burnett, Martha Doty Freeman, Jerome C. Rose, D. Gentry Steele, Ben W. Olive, and Karl J. Reinhard, pp. 132–148. Research Series No. 38. Arkansas Archeological Survey, Fayetteville.

Rose J. C., and M. K. Marks
1985 Bioarcheology of the Alexander Site. In *The Alexander Site, Conway County, Arkansas*, edited by E. T. Hemmings and J. H. House, pp. 79–98. Research Series No. 24. Arkansas Archeological Survey, Fayetteville.

Rose J. C., M. Nassaney, and M. Blaeuer
1984 Paleopathology and the Origins of Maize Agriculture in the Lower Mississippi Valley and Caddoan Culture Areas. In *Paleopathology at the Origins of Agriculture*, edited by M. C. Cohen and G. J. Armelagos, pp. 393–424. Academic Press, New York.

Schoeninger, M. J.
1989 Prehistoric Human Diet. In *Chemistry of Prehistoric Human Bone*, edited by T. D. Price, pp. 38–67. Cambridge University Press, Cambridge.

Scott, E. C.
1979 Principal Axis Analysis of Dental Attrition Data. *American Journal of Physical Anthropology* 51:203–211.

Smith, B. H.
1984 Patterns of Molar Wear in Hunter-Gatherers and Agriculturalists. *American Journal of Physical Anthropology* 63:39–56.

Steele, D. G.
1989 Zooarchaeology, Taphonomy and Preservation

of the Fossil Faunal Assemblage. In *Interdisciplinary Workshop on the Physical-Chemical-Biological Processes Affecting Archeological Sites*, compiled by Christopher C. Mathewson, pp. 65–84. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C., Contract No. DACW39-86-K-0016, Environmental Laboratory, U.S. Army Engineer Waterways Experiment Station, P.O. Box 631, Vicksburg, Mississippi.

Steele, D. G., and C. C. Bramblett
1988 *The Anatomy and Biology of the Human Skeleton.* Texas A&M University Press, College Station.

Steele, D. G., and B. W. Olive
1989 Bioarchaeology of Region 3 Study Area. In *From the Gulf Coast to the Rio Grande: Human Adaptation in Central, South, and Lower Pecos Texas*, by Thomas R. Hester, Stephen L. Black, D. Gentry Steele, Ben W. Olive, Anne A. Fox, Karl J. Reinhard, and Leland C. Bement, pp. 93–114. Arkansas Archeological Survey Research Series No. 33. Center for Archaeological Research at The University of Texas at San Antonio, Texas A&M University, College Station, and the Arkansas Archeological Survey, Fayetteville.

Steele, D. G., and J. F. Powell
n.d. An Osteological Examination of Prehistoric Hunters and Gatherers of the Southern Desert and Semi-arid Region of North America. Ms. on file, Department of Anthropology, Texas A&M University, College Station.

Stewart, T. D.
1979 *Essentials of Forensic Anthropology Especially as Developed in the United States.* Charles C. Thomas, Springfield, Illinois.

Stini, W. A.
1985 Growth Rates and Sexual Dimorphism in Evolutionary Perspective. In *The Analysis of Prehistoric Diets*, edited by Robert I. Gilbert Jr. and James H. Mielke, pp. 104–155. Academic Press, New York.

Story, D. A., J. A. Guy, D. G. Steele, B. A. Burnett, and M. D. Freeman
1990 Gulf Coastal Plain Adaptation Types: A Preliminary Statement. In *The Archeology and Bioarcheology of the Gulf Coastal Plain: Volume 2*, by D. A. Story, Janice A. Guy, Barbara A. Burnett, Martha Doty Freeman, Jerome C. Rose, D. Gentry Steele, Ben W. Olive, and Karl J. Reinhard, pp. 425–434. Research Series No. 38. Arkansas Archeological Survey, Fayetteville.

Swanton, J. R.
1942 Source Material on the History and Ethnology of the Caddo Indians. *Bureau of American Ethnology Bulletin* 132. Smithsonian Institution, Washington, D.C.

Tiné, A., and L. Tieszen
1994 Bioarchaeology. In *The McLelland and Joe Clark Sites: Protohistoric and Historic Caddoan Farmsteads in Southern Bossier Parish, Louisiana*, edited by David B. Kelley, pp. 213–238. Report submitted to U. S. Army Corps of Engineers, Vicksburg District, Contract No. DACW38-91-D-0014.

Turner, C. G., II
1979 Dental Anthropological Indications of Agriculture Among the Jomon People of Central Japan. *American Journal of Physical Anthropology* 48:101–106.

Turner, C. G., II, C. Nichol, and G. Scott
1991 Scoring Procedures for Key Morphological Traits of the Permanent Dentition: The Arizona State University Dental Anthropology System. In *Advances in Dental Anthropology*, edited by M. Kelley and C. S. Larsen, pp. 13–31. Wiley-Liss, New York.

Walker, P. L.
1986 Sex Differences in the Diet and Dental Health of Prehistoric and Modern Hunter-Gatherers. Paper presented at European meeting of the Paleopathology Association, Madrid.

Webb, C. H.
1959 The Belcher Mound: A Stratified Caddoan Site in Caddo Parish, Louisiana. *Society for American Archaeology Memoirs* 16.

Westbury, M. S.
1975 Human Skeletal Material from Cooper Lake. In *Archaeological Research at Cooper Lake, Northeast Texas, 1973*, by R. D. Hyatt and K. Doehner, pp. 67–69. Contributions in Anthropology No. 15. Southern Methodist University, Dallas.

1978 Appendix III: Osteological Analysis. In *Archaeological Research at the Proposed Cooper Lake, Northeast Texas, 1974-1975*, by

K. Doehner and R. E. Larson, pp. 159–196. Research Report 108. Archaeology Research Program, Southern Methodist University, Dallas.

Wilson, D.
1994 Division of Labor and Stress Loads at the Sanders Site (41LR2), Lamar County, Texas. *Bulletin of the Texas Archeological Society* 65:129–160.

1995 Dental Paleopathology in the Sanders Site (41LR2) and Mitchell Site (41BW3) Populations from the Red River Valley, Northeast Texas. Papers presented at the 1995 Caddo Conference, Austin.

Wilson D. E., and D. Cargill
1993 Stable Isotope Analysis from the Sanders Site. *Caddoan Archeology Newsletter* 4:3.

Wilson, D., and D. G. Steele
1996 *Prehistoric Human Remains from 12 Sites at U.S. Army Corps of Engineers Reservoirs in Bell, Delta, Denton, Ellis, Hill, Martin, and Navarro Counties, Texas.* Technical Reports No. 23. Prewitt and Associates, Austin.